Appendix A

Sanitary Sewer Modelling

MUNICIPALITY: **City of Guelph**
PROJECT: **York Trunk Sewer Class EA**
FROM: **GENIVAR Inc.**
TO: **City of Guelph**

(green)	<50% Capacity
(yellow)	80%<100% Capacity
(red)	>100% Capacity
(grey)	Flat Pipe or Pipe of Negative Slope

1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 4.5 m/s
3) Infiltration = 0.1 l/s/ha
4) Residential/ICI = 300 lpcd = 0.003472 L/cap/s
5) Manning; n = 0.013 for less than 1650mm and 0.011 for greater

2011 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID) From	Manhole (Object ID) To	Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha) Catchment Area (ha)	SERVICE AREA (ha) Catchment Area - Accumulated	POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections) Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population	Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)	Percent Full	Reserve Capacity L/s	
	Rockwood	4655	S5480	7668	PWOPRSED0006000	Gravity		0.00										34.72	300	0.075	331.43	330.96	96.93	0.48	0.95	0.07	67.34	52%	32.61	
	4655	4654	S4892	6225	PWOPRSED0004644	Gravity		0.00										34.72	300	0.075	330.9	330.67	47.24	0.49	0.95	0.07	67.47	51%	32.75	
Rockwood Flows	4654	4653	S6124	4968	PWOPRSED0004645	Gravity		0.00										34.72	300	0.075	330.575	329.96	120.09	0.51	0.98	0.07	69.20	50%	34.48	
	4653	4656	S1473	3655	PWOPRSED0004646	Gravity		0.00										34.72	300	0.075	329.96	329.375	119.79	0.49	0.96	0.07	67.58	51%	32.85	
	4656	6624	S2716	3209	PWOPRSED0004647	Gravity		0.00										34.72	300	0.075	333.51	329.115	49.81	8.82	4.06	0.07	287.24	12%	252.52	
	6624	4657	S465	587	PWOPRSED0004648	Gravity	18.68	18.68	107	35	370	370	405	1.41	4.34	6.11	1.87	42.70	300	0.075	329.115	328.75	70.4	0.52	0.99	0.07	69.63	61%	26.93	
	4657	5688	S2800	1898	PWOPRSED0004767	Gravity	18.68	18.68	107	107	370	370	477	1.66	4.24	7.01	1.87	43.60	300	0.075	328.75	325.755	87.48	3.42	2.53	0.07	178.93	24%	135.32	
Catchment Area 51	5688	5689	S4754	2750	PWOPRSED0004768	Gravity	18.68	18.68	107	107	370	370	477	1.66	4.24	7.01	1.87	43.60	300	0.075	325.755	322.97	82.78	3.36	2.51	0.07	177.37	25%	133.77	
	5689	5690	S4755	2751	PWOPRSED0004769	Gravity	18.68	18.68	107	107	370	370	477	1.66	4.24	7.01	1.87	43.60	300	0.075	322.97	321.335	80.62	2.03	1.95	0.07	137.71	32%	94.11	
	5690	5691	S2226	2464	PWOPRSED0004770	Gravity	18.68	18.68	107	107	370	370	477	1.66	4.24	7.01	1.87	43.60	300	0.075	321.335	319.69	80.47	2.04	1.96	0.07	138.26	32%	94.66	
Catchment Area 52	5691	1028	S1554	2514	PWOPRSED0004771	Gravity	76.15	94.83	349	455	1474	1845	2300	7.99	3.99	31.90	9.48	41.38	375	0.09375	319.69	316.475	8.5	37.82	9.76	0.11	1078.30	4%	1036.91	
	1028	4650	S4278	4667	PWOPRSED0004640	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	316.4	315.88	103.9	0.50	1.66	0.36	594.67	28%	430.44	
	4650	4651	S492	538	PWOPRSED0004641	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	315.805	315.565	19.2	1.25	2.63	0.36	939.81	17%	775.58	
	4651	4652	S5501	6131	PWOPRSED0004642	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	315.49	313.88	122.4	1.32	2.69	0.36	964.06	17%	799.83	
	4652	6616	S840	927	PWOPRSED0004643	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	311.055	310.94	82.3	0.14	0.88	0.36	314.22	52%	149.99	
Catchment Area 36,37,38, 39	6616	6617	S5055	6570	PWOPRSED0004617	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	310.94	310.78	83.06	0.19	1.03	0.36	368.93	45%	204.70	
	6617	6618	S5058	6573	PWOPRSED0004618	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	310.735	310.665	20.26	0.35	1.38	0.36	494.10	33%	329.87	
	6618	6619	S5059	6574	PWOPRSED0004619	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	310.59	310.465	91.44	0.14	0.87	0.36	310.79	53%	146.56	
	6619	6620	S2690	2621	PWOPRSED0004621	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	310.415	310.25	93.57	0.18	0.99	0.36	352.99	47%	188.76	
	6620	6612	S5060	6575	PWOPRSED0004620	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	310.22	310.075	101.41	0.14	0.89	0.36	317.85	52%	153.62	
	6612	767	S1682	3716	PWOPRSED0005966	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	310.075	309.895	99.33	0.18	1.00	0.36	357.83	46%	193.60	
	767	4456	S4234	5539	PWOPRSED0004611	Gravity	354.99	449.82	6668	7124	1435	3279	10403	36.12	3.10	119.25	44.98	164.23	675	0.16875	309.895	309.705	123.53	0.15	0.92	0.36	329.67	50%	165.44	
	4456	4384	S6002	7553	PWOPRSED0004605	Gravity	46.62	496.44	1503	8626	253	3532	12159	42.22	3.02	127.42	49.64	177.06	675	0.16875	309.705	309.575	105.52	0.12	0.82	0.36	295.04	60%	117.98	
Catchment Area 41	4384	6977	S6380	4770	PWOPRSED0004606	Gravity	46.62	496.44	1503	8626	253	3532	12159	42.22	3.02	127.42	49.64	177.06	675	0.16875	309.545	309.425	65.59	0.18	1.00	0.36	359.55	49%	182.48	
	6977	6978	S379	458	PWOPRSED0004591	Gravity	46.62	496.44	1503	8626	253	3532	12159	42.22	3.02	127.42	49.64	177.06	675	0.16875	309.4	309.35	26.42	0.19	1.02	0.36	365.68	48%	188.62	
	6978	4005	S1823	3484	PWOPRSED0006818	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	750	0.1875	309.355	309.345	3.4	0.29	1.37	0.44	603.76	32%	408.98	
	4005	4006	S6517	6832	PWOPRSIP0000041	siphon	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	97.39	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	32%	209.77	
	4005	4006	S839	925	PWOPRSIP0000040	siphon	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	97.39	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	32%	209.77	
	4006	4004	S5730	4828	PWOPRSED0006819	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	750	0.1875	309.155	309.145	4	0.25	1.26	0.44	556.64	35%	361.86	
	4004	4383	S6001	7552	PWOPRSED0004604	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.9	309.03	97.358	0.00	0.00	0.64	0.00		-194.78	*
	4383	4381	S5311	7612	PWOPRSED0004603	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.945	308.8	85.1	0.17	1.17	0.64	747.26	26%	552.48	
	4381	277	S2808	2883	PWOPRSED0004667	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.8	308.76	74.67	0.05	0.66	0.64	419.00	46%	224.22	
Catchment Area 53	277	98	S1958	2379	PWOPRSED0004668	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.76	308.695	76.55	0.08	0.83	0.64	527.52	37%	332.74	
	98	276	S147	137	PWOPRSED0004669	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.695	308.66	77.11	0.05	0.61	0.64	385.68	51%	190.90	
	276	4741	S4128	5188	PWOPRSED0004665	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.62	308.575	22.55	0.20	1.27	0.64	808.70	24%	613.92	
	4741	4740	S6511	6824	PWOPRSED0004666	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.575	308.46	68.51	0.17	1.17	0.64	741.69	26%	546.92	
	4740	4739	S3387	4303	PWOPRSED0004664	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.49	308.415	95.85	0.08	0.80	0.64	506.39	38%	311.61	
	4739	4738	S5719	7489	PWOPRSED0004661	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.35	308.405	50.87	0.00	0.00	0.64	0.00		-194.78	*
	4738	4737	S201	409	PWOPRSED0004662	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.405	308.19	107.59	0.20	1.27	0.64	809.26	24%	614.48	
	4737	4092	S1968	2390	PWOPRSED0004663	Gravity	54.16	550.60	319	8946	923	4456	13401	46.53	3.00	139.72	55.06	194.78	900	0.225	308.19	308.355	30.76	0.00	0.00	0.64	0.00		-194.78	*

2011 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID) From	Manhole (Object ID) To	Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha) Catchment Area (ha)	SERVICE AREA (ha) Catchment Area - Accumulated	POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections) Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population	Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)	Percent Full	Reserve Capacity L/s	
Catchment Area 49	4092	4376	S7500	5094		Gravity	28.20	578.79	650	9596	138	4594	14190	49.27	2.97	146.46	57.88	204.34	900	0.225	308.355	308.19	43.21	0.38	1.76	0.64	1118.67	18%	914.34	
	4376	4377	S5739	6449	PWOPRSED0004310	Gravity	28.20	578.79	650	9596	138	4594	14190	49.27	2.97	146.46	57.88	204.34	900	0.225	308.175	307.975	92.04	0.22	1.33	0.64	843.88	24%	639.54	
	4377	4378	S5740	6450	PWOPRSED0004311	Gravity	28.20	578.79	650	9596	138	4594	14190	49.27	2.97	146.46	57.88	204.34	900	0.225	307.975	307.89	30.54	0.28	1.50	0.64	955.05	21%	750.72	
CA 59 & 60	4378	6923	S792	861	PWOPRSED0004292	Gravity	55.25	634.04	1186	10782	531	5125	15907	55.23	2.92	161.40	63.40	224.80	600	0.15	307.89	307.805	228.29	0.04	0.42	0.28	118.48	190%	-106.32	
CA 54	6923	4483	S5147	6306	PWOPRSED0004259	Gravity	10.73	644.78	185	10968	110	5235	16202	56.26	2.91	163.98	64.48	228.46	675	0.16875	307.805	307.715	163.83	0.05	0.55	0.36	197.02	116%	-31.44	
Catchment Area 56	4483	4482	S955	1026	PWOPRSED0004285	Gravity	13.41	658.18	401	11368	10	5244	16613	57.68	2.90	167.23	65.82	233.05	675	0.16875	307.715	307.585	89.76	0.14	0.89	0.36	319.90	73%	86.85	
82% of CA 46 & 47, 100% 43, 34, 40, 35,42	4482	2883	S6275	4736	PWOPRSED0004477	Gravity	289.74	947.93	7870	19238	2509	7753	26992	93.72	2.67	250.18	94.79	344.97	750	0.1875	307.585	307.445	159.31	0.09	0.75	0.44	330.02	105%		
	2883	229	S724	809	PWOPRSED0004426	Gravity	289.74	947.93	7870	19238	2509	7753	26992	93.72	2.67	250.18	94.79	344.97	750	0.1875	307.445	307.3	385.18	0.04	0.49	0.44	216.00	160%	-128.97	
	229	5450	S1066	1181	PWOPRSED0004414	Gravity	289.74	947.93	7870	19238	2509	7753	26992	93.72	2.67	250.18	94.79	344.97	750	0.1875	306.97	306.93	104.55	0.04	0.49	0.44	217.76	158%	-127.22	
	5450	5449	S2352	3898	PWOPRSED0004413	Gravity	289.74	947.93	7870	19238	2509	7753	26992	93.72	2.67	250.18	94.79	344.97	750	0.1875	306.95	306.93	15.39	0.13	0.91	0.44	401.33	86%	56.35	
	5449	1776	S3037	3010	PWOPRSED0004412	Gravity	289.74	947.93	7870	19238	2509	7753	26992	93.72	2.67	250.18	94.79	344.97	750	0.1875	306.93	306.89	96.31	0.04	0.51	0.44	226.88	152%	-118.09	
	1776	1774	S1067	1182	PWOPRSED0004415	Gravity	289.74	947.93	7870	19238	2509	7753	26992	93.72	2.67	250.18	94.79	344.97	750	0.1875	306.89	306.7	95.09	0.20	1.13	0.44	497.64	69%	152.66	
CA 58	1774	1775	S3918	5968	PWOPRSED0004420	Gravity	156.92	1104.84	1715	20954	3744	11497	32451	112.68	2.63	296.58	110.48	407.07	750	0.1875	306.685	306.7	32.91	0.00	0.00	0.44	0.00		-407.07	*
	1775	1821	S2378	3387	PWOPRSED0004392	Gravity	156.92	1104.84	1715	20954	3744	11497	32451	112.68	2.63	296.58	110.48	407.07	750	0.1875	306.7	306.295	440.13	0.09	0.76	0.44	337.71	121%	-69.36	
CA 50, 57 & 18% of 46 & 47	1821	6199	S4046	2783	PWOPRSED0001960	Gravity	105.36	1210.20	2806	23759	613	12111	35870	124.55	2.58	321.03	121.02	442.05	900	0.225	306.095	305.36	651.2	0.11	0.96	0.64	608.19	73%	166.14	
	6199	823	S6061	4642	PWOPRSED0001845	Gravity	105.36	1210.20	2806	23759	613	12111	35870	124.55	2.58	321.03	121.02	442.05	900	0.225	305.36	305.115	219.36	0.11	0.95	0.64	605.00	73%	162.95	
	823	4822	S4577	5165	PWOPRSED0001999	Gravity	105.36	1210.20	2806	23759	613	12111	35870	124.55	2.58	321.03	121.02	442.05	900	0.225	305.115	304.89	193.79	0.12	0.97	0.64	616.85	72%	174.80	
	4822	680	S2912	3111	PWOPRSED0001897	Gravity	105.36	1210.20	2806	23759	613	12111	35870	124.55	2.58	321.03	121.02	442.05	900	0.225	304.89	304.72	245.88	0.07	0.75	0.64	476.01	93%	33.96	
	680	679	S2095	2117	PWOPRSED0002949	Gravity	105.36	1210.20	2806	23759	613	12111	35870	124.55	2.58	321.03	121.02	442.05	900	0.225	304.72	304.615	71.48	0.15	1.09	0.64	693.83	64%	251.78	
	679	678	S2096	2118	PWOPRSED0002950	Gravity	105.36	1210.20	2806	23759	613	12111	35870	124.55	2.58	321.03	121.02	442.05	900	0.225	304.615	304.54	77.11	0.10	0.89	0.64	564.58	78%	122.53	
CA 72 & 74	new MH	678	n/a			Gravity	131.30	1341.50	2527	26287	881	12992	39278	136.38	2.53	345.58	134.15	479.73	450	0.1125	302.905	304.54	31	0.00	0.00	0.16	0.00		-479.73	*
	678	298	S2567	3438	PWOPRSED0005877	Gravity	131.30	1341.50	2527	26287	881	12992	39278	136.38	2.53	345.58	134.15	479.73	900	0.225	304.54	304.18	327.2	0.11	0.94	0.64	600.48	80%	120.75	
	298	731	S2609	3441	PWOPRSED0005878	Gravity	131.30	1341.50	2527	26287	881	12992	39278	136.38	2.53	345.58	134.15	479.73	1050	0.2625	304.18	303.5	434.95	0.16	1.25	0.87	1079.72	44%	599.99	
	731	374	S4353	5524	PWOPRSED0005921	Gravity	131.30	1341.50	2527	26287	881	12992	39278	136.38	2.53	345.58	134.15	479.73	1350	0.3375	303.5	303.49	6.2	0.16	1.50	1.43	2143.55	22%	1663.82	
CA 86	374	732	S4137	5479	PWOPRSED0005922	Gravity	11.90	1353.40	206	26492	0	12992	39484	137.10	2.53	346.93	135.34	482.27	1350	0.3375	303.49	303.49	64	0.00	0.00	1.43	0.00		-482.27	*
	732	733	S718	803	PWOPRSED0005923	Gravity	11.90	1353.40	206	26492	0	12992	39484	137.10	2.53	346.93	135.34	482.27	1350	0.3375	303.49	303.49	91	0.00	0.00	1.43	0.00		-482.27	*
	733	324	S4917	6546	PWOPRSED0005924	Gravity	11.90	1353.40	206	26492	0	12992	39484	137.10	2.53	346.93	135.34	482.27	1350	0.3375	303.49	303.32	68.5	0.25	1.86	1.43	2658.94	18%	2176.67	
Speed Trunk and Wellington Trunk	324	587	S684	848	PWOPRSED0005919	Gravity	1838.76	3192.16	41128	67620	28521	41513	109133	378.93	2.15	812.95	319.22	1132.17	1650	0.4125	303.32	303.22	98.8	0.10	1.36	2.14	2899.69	39%	1767.52	
	587	590	S3547	4061	PWOPRSED0005326	Gravity	1838.76	3192.16	41128	67620	28521	41513	109133	378.93	2.15	812.95	319.22	1132.17	1650	0.4125	303.285	303.235	112.65	0.04	0.90	2.14	1920.21	59%	788.05	
	590	4972	S1632	1937	PWOPRSIP0000043	siphon	1838.76	3192.16	41128	67620	28521	41513	109133	378.93	2.15	812.95	319.22	1132.17	1650	0.4125	303.235	303.205	31.6	0.09	1.31	2.14	2808.33	40%	1676.16	
	4972	1000	S1633	1938	PWOPRSED0005328	Gravity	1838.76	3192.16	41128	67620	28521	41513	109133	378.93	2.15	812.95	319.22	1132.17	1650	0.4125	303.155	303.13	74.82	0.03	0.78	2.14	1666.06	68%	533.89	^
	1001	2284	S1159	1312	PWOPRSED0005329	Gravity	1838.76	3192.16	41128	67620	28521	41513	109133	378.93	2.15	812.95	319.22	1132.17	1200	0.3	0	0	112.17	0.00	0.00	1.13	0.00		-1132.17	* ^
	1002	2284	S825	907	PWOPRSED0005330	Gravity	1838.76	3192.16	41128	67620	28521	41513	109133	378.93	2.15	812.95	319.22	1132.17	1200	0.3	303.125	302.849	112.16	0.25	1.71	1.13	1934.01	59%	801.84	^

* Pipe is at 0% or negative slope. For analysis all negative slopes were set to 0%

^ Manhole Id are unknown. Temporary placeholder provided as ID.

MUNICIPALITY: **City of Guelph**
PROJECT: **York Trunk Sewer Class EA**
FROM: **GENIVAR Inc.**
TO: **City of Guelph**

(green)	<50% Capacity
(yellow)	80%<100% Capacity
(red)	>100% Capacity
(grey)	Flat Pipe or Pipe of Negative Slope

1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 4.5 m/s
3) Infiltration = 0.1 l/s/ha
4) Residential/ICI = 300 lpcd = 0.003472 L/cap/s
5) Manning; n = 0.013 for less than 1650mm and 0.011 for greater

2016 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID) From	Manhole (Object ID) To	Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha) Catchment Area (ha)	SERVICE AREA (ha) Catchment Area - Accumulated	POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections) Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population	Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)	Percent Full	Reserve Capacity L/s
	Rockwood	4655	S5480	7668	PWOPRSED0006000	Gravity		0.00										34.72	300	0.075	331.43	330.96	96.93	0.48	0.95	0.07	67.34	52%	32.61
	4655	4654	S4892	6225	PWOPRSED0004644	Gravity		0.00										34.72	300	0.075	330.9	330.67	47.24	0.49	0.95	0.07	67.47	51%	32.75
Rockwood Flows	4654	4653	S6124	4968	PWOPRSED0004645	Gravity		0.00										34.72	300	0.075	330.575	329.96	120.09	0.51	0.98	0.07	69.20	50%	34.48
	4653	4656	S1473	3655	PWOPRSED0004646	Gravity		0.00										34.72	300	0.075	329.96	329.375	119.79	0.49	0.96	0.07	67.58	51%	32.85
	4656	6624	S2716	3209	PWOPRSED0004647	Gravity		0.00										34.72	300	0.075	333.51	329.115	49.81	8.82	4.06	0.07	287.24	12%	252.52
	6624	4657	S465	587	PWOPRSED0004648	Gravity	18.68	18.68	179	35	460	460	494	1.72	4.34	7.46	1.87	44.05	300	0.075	329.115	328.75	70.4	0.52	0.99	0.07	69.63	63%	25.58
	4657	5688	S2800	1898	PWOPRSED0004767	Gravity	18.68	18.68	179	179	460	460	638	2.22	4.17	9.23	1.87	45.82	300	0.075	328.75	325.755	87.48	3.42	2.53	0.07	178.93	26%	133.11
Catchment Area 51	5688	5689	S4754	2750	PWOPRSED0004768	Gravity	18.68	18.68	179	179	460	460	638	2.22	4.17	9.23	1.87	45.82	300	0.075	325.755	322.97	82.78	3.36	2.51	0.07	177.37	26%	131.55
	5689	5690	S4755	2751	PWOPRSED0004769	Gravity	18.68	18.68	179	179	460	460	638	2.22	4.17	9.23	1.87	45.82	300	0.075	322.97	321.335	80.62	2.03	1.95	0.07	137.71	33%	91.89
	5690	5691	S2226	2464	PWOPRSED0004770	Gravity	18.68	18.68	179	179	460	460	638	2.22	4.17	9.23	1.87	45.82	300	0.075	321.335	319.69	80.47	2.04	1.96	0.07	138.26	33%	92.44
Catchment Area 52	5691	1028	S1554	2514	PWOPRSED0004771	Gravity	76.15	94.83	626	804	1831	2290	3095	10.75	3.86	41.47	9.48	50.95	375	0.09375	319.69	316.475	8.5	37.82	9.76	0.11	1078.30	5%	1027.35
	1028	4650	S4278	4667	PWOPRSED0004640	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	316.4	315.88	103.9	0.50	1.66	0.36	594.67	31%	410.18
	4650	4651	S492	538	PWOPRSED0004641	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	315.805	315.565	19.2	1.25	2.63	0.36	939.81	20%	755.31
	4651	4652	S5501	6131	PWOPRSED0004642	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	315.49	313.88	122.4	1.32	2.69	0.36	964.06	19%	779.57
	4652	6616	S840	927	PWOPRSED0004643	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	311.055	310.94	82.3	0.14	0.88	0.36	314.22	59%	129.73
	6616	6617	S5055	6570	PWOPRSED0004617	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	310.94	310.78	83.06	0.19	1.03	0.36	368.93	50%	184.44
Catchment Area 36,37,38, 39	6617	6618	S5058	6573	PWOPRSED0004618	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	310.735	310.665	20.26	0.35	1.38	0.36	494.10	37%	309.61
	6618	6619	S5059	6574	PWOPRSED0004619	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	310.59	310.465	91.44	0.14	0.87	0.36	310.79	59%	126.30
	6619	6620	S2690	2621	PWOPRSED0004621	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	310.415	310.25	93.57	0.18	0.99	0.36	352.99	52%	168.49
	6620	6612	S5060	6575	PWOPRSED0004620	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	310.22	310.075	101.41	0.14	0.89	0.36	317.85	58%	133.36
	6612	767	S1682	3716	PWOPRSED0005966	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	310.075	309.895	99.33	0.18	1.00	0.36	357.83	52%	173.34
	767	4456	S4234	5539	PWOPRSED0004611	Gravity	354.99	449.82	7738	8542	1766	4056	12598	43.74	3.02	139.51	44.98	184.49	675	0.16875	309.895	309.705	123.53	0.15	0.92	0.36	329.67	56%	145.17
	4456	4384	S6002	7553	PWOPRSED0004605	Gravity	46.62	496.44	1692	10235	300	4356	14591	50.66	2.94	149.19	49.64	198.83	675	0.16875	309.705	309.575	105.52	0.12	0.82	0.36	295.04	67%	96.21
Catchment Area 41	4384	6977	S6380	4770	PWOPRSED0004606	Gravity	46.62	496.44	1692	10235	300	4356	14591	50.66	2.94	149.19	49.64	198.83	675	0.16875	309.545	309.425	65.59	0.18	1.00	0.36	359.55	55%	160.71
	6977	6978	S379	458	PWOPRSED0004591	Gravity	46.62	496.44	1692	10235	300	4356	14591	50.66	2.94	149.19	49.64	198.83	675	0.16875	309.4	309.35	26.42	0.19	1.02	0.36	365.68	54%	166.85

2016 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID) From	Manhole (Object ID) To	Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha) Catchment Area (ha)	SERVICE AREA (ha) Catchment Area - Accumulated	POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections) Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population	Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)	Percent Full	Reserve Capacity L/s	
Catchment Area 53	6978	4005	S1823	3484	PWOPRSED0006818	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	750	0.1875	309.355	309.345	3.4	0.29	1.37	0.44	603.76	36%	384.23	
	4005	4006	S6517	6832	PWOPRSIP0000041	siphon	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	109.77	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	36%	197.40	
	4005	4006	S839	925	PWOPRSIP0000040	siphon	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	109.77	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	36%	197.40	
	4006	4004	S5730	4828	PWOPRSED0006819	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	750	0.1875	309.155	309.145	4	0.25	1.26	0.44	556.64	39%	337.11	
	4004	4383	S6001	7552	PWOPRSED0004604	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.9	309.03	97.358	0.00	0.00	0.64	0.00		-219.53	*
	4383	4381	S5311	7612	PWOPRSED0004603	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.945	308.8	85.1	0.17	1.17	0.64	747.26	29%	527.73	
	4381	277	S2808	2883	PWOPRSED0004667	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.8	308.76	74.67	0.05	0.66	0.64	419.00	52%	199.46	
	277	98	S1958	2379	PWOPRSED0004668	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.76	308.695	76.55	0.08	0.83	0.64	527.52	42%	307.99	
	98	276	S147	137	PWOPRSED0004669	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.695	308.66	77.11	0.05	0.61	0.64	385.68	57%	166.15	
	276	4741	S4128	5188	PWOPRSED0004665	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.62	308.575	22.55	0.20	1.27	0.64	808.70	27%	589.17	
	4741	4740	S6511	6824	PWOPRSED0004666	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.575	308.46	68.51	0.17	1.17	0.64	741.69	30%	522.16	
	4740	4739	S3387	4303	PWOPRSED0004664	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.49	308.415	95.85	0.08	0.80	0.64	506.39	43%	286.86	
	4739	4738	S5719	7489	PWOPRSED0004661	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.35	308.405	50.87	0.00	0.00	0.64	0.00		-219.53	*
	4738	4737	S201	409	PWOPRSED0004662	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.405	308.19	107.59	0.20	1.27	0.64	809.26	27%	589.72	
	4737	4092	S1968	2390	PWOPRSED0004663	Gravity	54.16	550.60	479	10714	1125	5481	16195	56.23	2.92	164.47	55.06	219.53	900	0.225	308.19	308.385	30.76	0.00	0.00	0.64	0.00		-219.53	*
Catchment Area 49	4092	4376	S7500	5094		Gravity	28.20	578.79	693	11407	143	5624	17031	59.14	2.90	171.36	57.88	229.24	900	0.225	308.355	308.19	43.21	0.38	1.76	0.64	1118.67	20%	889.43	
	4376	4377	S5739	6449	PWOPRSED0004310	Gravity	28.20	578.79	693	11407	143	5624	17031	59.14	2.90	171.36	57.88	229.24	900	0.225	308.175	307.975	92.04	0.22	1.33	0.64	843.88	27%	614.64	
	4377	4378	S5740	6450	PWOPRSED0004311	Gravity	28.20	578.79	693	11407	143	5624	17031	59.14	2.90	171.36	57.88	229.24	900	0.225	307.975	307.89	30.54	0.28	1.50	0.64	955.05	24%	725.82	
CA 59 & 60	4378	6923	S792	861	PWOPRSED0004292	Gravity	55.25	634.04	1517	12924	614	6238	19162	66.54	2.84	189.18	63.40	252.59	600	0.15	307.89	307.805	228.29	0.04	0.42	0.28	118.48	213%	-134.11	
CA 54	6923	4483	S5147	6306	PWOPRSED0004259	Gravity	10.73	644.78	195	13119	110	6348	19467	67.59	2.84	191.75	64.48	256.23	675	0.16875	307.805	307.715	163.83	0.05	0.55	0.36	197.02	130%	-59.21	
Catchment Area 56	4483	4482	S955	1026	PWOPRSED0004285	Gravity	13.41	658.18	468	13587	10	6358	19945	69.25	2.82	195.39	65.82	261.21	675	0.16875	307.715	307.585	89.76	0.14	0.89	0.36	319.90	82%	58.69	
82% of CA 46 & 47, 100% 43, 34, 40, 35,42	4482	2883	S6275	4736	PWOPRSED0004477	Gravity	289.74	947.93	8474	22061	2650	9008	31069	107.88	2.61	281.54	94.79	376.33	750	0.1875	307.585	307.445	159.31	0.09	0.75	0.44	330.02	114%		
	2883	229	S724	809	PWOPRSED0004426	Gravity	289.74	947.93	8474	22061	2650	9008	31069	107.88	2.61	281.54	94.79	376.33	750	0.1875	307.445	307.3	385.18	0.04	0.49	0.44	216.00	174%	-160.33	
	229	5450	S1066	1181	PWOPRSED0004414	Gravity	289.74	947.93	8474	22061	2650	9008	31069	107.88	2.61	281.54	94.79	376.33	750	0.1875	306.97	306.93	104.55	0.04	0.49	0.44	217.76	173%	-158.58	
	5450	5449	S2352	3898	PWOPRSED0004413	Gravity	289.74	947.93	8474	22061	2650	9008	31069	107.88	2.61	281.54	94.79	376.33	750	0.1875	306.95	306.93	15.39	0.13	0.91	0.44	401.33	94%	25.00	
	5449	1776	S3037	3010	PWOPRSED0004412	Gravity	289.74	947.93	8474	22061	2650	9008	31069	107.88	2.61	281.54	94.79	376.33	750	0.1875	306.93	306.89	96.31	0.04	0.51	0.44	226.88	166%	-149.45	
	1776	1774	S1067	1182	PWOPRSED0004415	Gravity	289.74	947.93	8474	22061	2650	9008	31069	107.88	2.61	281.54	94.79	376.33	750	0.1875	306.89	306.7	95.09	0.20	1.13	0.44	497.64	76%	121.31	
CA 58	1774	1775	S3918	5968	PWOPRSED0004420	Gravity	156.92	1104.84	2265	24327	3880	12888	37215	129.22	2.57	331.75	110.48	442.24	750	0.1875	306.685	306.7	32.91	0.00	0.00	0.44	0.00		-442.24	*
	1775	1821	S2378	3387	PWOPRSED0004392	Gravity	156.92	1104.84	2265	24327	3880	12888	37215	129.22	2.57	331.75	110.48	442.24	750	0.1875	306.7	306.295	440.13	0.09	0.76	0.44	337.71	131%	-104.53	
CA 50, 57 & 18% of 46 & 47	1821	6199	S4046	2783	PWOPRSED0001960	Gravity	105.36	1210.20	3182	27509	630	13519	41028	142.46	2.51	358.19	121.02	479.21	900	0.225	306.095	305.36	651.2	0.11	0.96	0.64	608.19	79%	128.98	
	6199	823	S6061	4642	PWOPRSED0001845	Gravity	105.36	1210.20	3182	27509	630	13519	41028	142.46	2.51	358.19	121.02	479.21	900	0.225	305.36	305.115	219.36	0.11	0.95	0.64	605.00	79%	125.79	
	823	4822	S4577	5165	PWOPRSED0001999	Gravity	105.36	1210.20	3182	27509	630	13519	41028	142.46	2.51	358.19	121.02	479.21	900	0.225	305.115	304.89	193.79	0.12	0.97	0.64	616.85	78%	137.64	
	4822	680	S2912	3111	PWOPRSED0001897	Gravity	105.36	1210.20	3182	27509	630	13519	41028	142.46	2.51	358.19	121.02	479.21	900	0.225	304.89	304.72	245.88	0.07	0.75	0.64	476.01	101%	-3.20	
	680	679	S2095	2117	PWOPRSED0002949	Gravity	105.36	1210.20	3182	27509	630	13519	41028	142.46	2.51	358.19	121.02	479.21	900	0.225	304.72	304.615	71.48	0.15	1.09	0.64	693.83	69%	214.62	
	679	678	S2096	2118	PWOPRSED0002950	Gravity	105.36	1210.20	3182	27509	630	13519	41028	142.46	2.51	358.19	121.02	479.21	900	0.225	304.615	304.54	77.11	0.10	0.89	0.64	564.58	85%	85.37	
CA 72 & 74	new MH	678	n/a			Gravity	131.30	1341.50	2641	30150	909	14428	44578	154.79	2.48	383.11	134.15	517.26	450	0.1125	302.905	304.54	31	0.00	0.00	0.16	0.00		-517.26	*
	678	298	S2567	3438	PWOPRSED0005877	Gravity	131.30	1341.50	2641	30150	909	14428	44578	154.79	2.48	383.11	134.15	517.26	900	0.225	304.54	304.18	327.2	0.11	0.94	0.64	600.48	86%	83.22	
	298	731	S2609	3441	PWOPRSED0005878	Gravity	131.30	1341.50	2641	30150	909	14428	44578	154.79	2.48	383.11	134.15	517.26	1050	0.2625	304.18	303.5	434.95	0.16	1.25	0.87	1079.72	48%	562.46	
	731	374	S4353	5524	PWOPRSED0005921	Gravity	131.30	1341.50	2641	30150	909	14428	44578	154.79	2.48	383.11	134.15	517.26	1350	0.3375	303.5	303.49	6.2	0.16	1.50	1.43	2143.55	24%	1626.29	
CA 86	374	732	S4137	5479	PWOPRSED0005922	Gravity	11.90	1353.40	217	30367	0	14428	44795	155.54	2.47	384.50	135.34	519.84	1350	0.3375	303.49	303.49	64	0.00	0.00	1.43	0.00		-519.84	*
	732	733	S718	803	PWOPRSED0005923	Gravity	11.90	1353.40	217	30367	0	14428	44795	155.54	2.47	384.50	135.34	519.84	1350	0.3375	303.49	303.49	91	0.00	0.00	1.43	0.00		-519.84	*
	733	324	S4917	6546	PWOPRSED0005924	Gravity	11.90	1353.40	217	30367	0	14428	44795	155.54	2.47	384.50	135.34	519.84	1350	0.3375	303.49	303.32	68.5	0.25	1.86	1.43	2658.94	20%	2139.11	
Speed Trunk and Wellington Trunk	324	587	S684	848	PWOPRSED0005919	Gravity	1838.76	3192.16	44866	75233	29774	44202	119435	414.71	2.10	872.81	319.22	1192.02	1650	0.4125	303.32	303.22	98.8	0.10	1.36	2.14	2899.69	41%	1707.67	
	587	590	S3547	4061	PWOPRSED0005326	Gravity	1838.76	3192.16	44866	75233	29774	44202	119435	414.71	2.10	872.81	319.22	1192.02	1650	0.4125	303.285	303.235	112.65	0.04	0.90	2.14	1920.21	62%	728.19	
	590	4972	S1632	1937	PWOPRSIP0000043	siphon	1838.76	3192.16	44866	75233	29774	44202	119435	414.71	2.10	872.81	319.22	1192.02	1650	0.4125	303.235	303.205	31.6	0.09	1.31	2.14	2808.33	42%	1616.30	
	4972	1000	S1633	1938	PWOPRSED0005328	Gravity	1838.76	3192.16	44866	75233	29774	44202	119435	414.71	2.10	872.81	319.22	1192.02	1650	0.4125	303.155	303.13	74.82	0.03	0.78	2.14	1666.06	72%	474.04	^
	1001	2284	S1159	1312	PWOPRSED0005329	Gravity	1838.76	3192.16	44866	75233	29774	44202	119435	414.71	2.10	872.81	319.22	1192.02	1200	0.3	0	0	112.17	0.00	0.00	1.13	0.00		-1192.02	* ^
	1002	2284	S825	907	PWOPRSED0005330	Gravity	1838.76	3192.16	44866	75233	29774	44202	119435	414.71	2.10	872.81	319.22	1192.02	1200	0.3	303.125	302.849	112.16	0.25	1.71	1.13	1934.01	62%	741.99	^

* Pipe is at 0% or negative slope. For analysis all negative slopes were set to 0%

^ Manhole Id are unknown. Temporary placeholder provided as ID.

MUNICIPALITY: **City of Guelph**
PROJECT: **York Trunk Sewer Class EA**
FROM: **GENIVAR Inc.**
TO: **City of Guelph**

Legend
<50% Capacity
80%<100% Capacity
>100% Capacity
Flat Pipe or Pipe of Negative Slope

1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 4.5 m/s
3) Infiltration 0.1 l/s/ha
4) Residential/ICI = 300 lpcd = 0.003472 L/cap/s
5) Manning; n = 0.013 for less than 1650mm and 0.011 for greater

2021 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID)		Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha)		POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections)					Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER									Percent Full	Reserve Capacity L/s	
	From	To					Catchment Area (ha)	Catchment Area - Accumulated (ha)	Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population						Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)			
	Rockwood	4655	S5480	7668	PWOPRSED0006000	Gravity		0.00										34.72	300	0.075	331.43	330.96	96.93	0.48	0.95	0.07	67.34	52%	32.61	
	4655	4654	S4892	6225	PWOPRSED0004644	Gravity		0.00										34.72	300	0.075	330.9	330.67	47.24	0.49	0.95	0.07	67.47	51%	32.75	
Rockwood Flows	4654	4653	S6124	4968	PWOPRSED0004645	Gravity		0.00										34.72	300	0.075	330.575	329.96	120.09	0.51	0.98	0.07	69.20	50%	34.48	
	4653	4656	S1473	3655	PWOPRSED0004646	Gravity		0.00										34.72	300	0.075	329.96	329.375	119.79	0.49	0.96	0.07	67.58	51%	32.85	
	4656	6624	S2716	3209	PWOPRSED0004647	Gravity		0.00										34.72	300	0.075	333.51	329.115	49.81	8.82	4.06	0.07	287.24	12%	252.52	
	6624	4657	S465	587	PWOPRSED0004648	Gravity	18.68	18.68	251	35	549	549	584	2.03	4.34	8.80	1.87	45.39	300	0.075	329.115	328.75	70.4	0.52	0.99	0.07	69.63	65%	24.23	
	4657	5688	S2800	1898	PWOPRSED0004767	Gravity	18.68	18.68	251	251	549	549	799	2.78	4.11	11.41	1.87	48.00	300	0.075	328.75	325.755	87.48	3.42	2.53	0.07	178.93	27%	130.93	
Catchment Area 51	5688	5689	S4754	2750	PWOPRSED0004768	Gravity	18.68	18.68	251	251	549	549	799	2.78	4.11	11.41	1.87	48.00	300	0.075	325.755	322.97	82.78	3.36	2.51	0.07	177.37	27%	129.37	
	5689	5690	S4755	2751	PWOPRSED0004769	Gravity	18.68	18.68	251	251	549	549	799	2.78	4.11	11.41	1.87	48.00	300	0.075	322.97	321.335	80.62	2.03	1.95	0.07	137.71	35%	89.71	
	5690	5691	S2226	2464	PWOPRSED0004770	Gravity	18.68	18.68	251	251	549	549	799	2.78	4.11	11.41	1.87	48.00	300	0.075	321.335	319.69	80.47	2.04	1.96	0.07	138.26	35%	90.26	
Catchment Area 52	5691	1028	S1554	2514	PWOPRSED0004771	Gravity	76.15	94.83	903	1154	2187	2736	3889	13.50	3.76	50.77	9.48	60.25	375	0.09375	319.69	316.475	8.5	37.82	9.76	0.11	1078.30	6%	1018.05	
	1028	4650	S4278	4667	PWOPRSED0004640	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	316.4	315.88	103.9	0.50	1.66	0.36	594.67	34%	390.53	
	4650	4651	S492	538	PWOPRSED0004641	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	315.805	315.565	19.2	1.25	2.63	0.36	939.81	22%	735.66	
	4651	4652	S5501	6131	PWOPRSED0004642	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	315.49	313.88	122.4	1.32	2.69	0.36	964.06	21%	759.92	
	4652	6616	S840	927	PWOPRSED0004643	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	311.055	310.94	82.3	0.14	0.88	0.36	314.22	65%	110.07	
Catchment Area 36,37,38, 39	6616	6617	S5055	6570	PWOPRSED0004617	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	310.94	310.78	83.06	0.19	1.03	0.36	368.93	55%	164.79	
	6617	6618	S5058	6573	PWOPRSED0004618	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	310.735	310.665	20.26	0.35	1.38	0.36	494.10	41%	289.95	
	6618	6619	S5059	6574	PWOPRSED0004619	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	310.59	310.465	91.44	0.14	0.87	0.36	310.79	66%	106.65	
	6619	6620	S2690	2621	PWOPRSED0004621	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	310.415	310.25	93.57	0.18	0.99	0.36	352.99	58%	148.84	
	6620	6612	S5060	6575	PWOPRSED0004620	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	310.22	310.075	101.41	0.14	0.89	0.36	317.85	64%	113.71	
	6612	767	S1682	3716	PWOPRSED0005966	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	310.075	309.895	99.33	0.18	1.00	0.36	357.83	57%	153.69	
	767	4456	S4234	5539	PWOPRSED0004611	Gravity	354.99	449.82	8808	9961	2097	4833	14794	51.37	2.96	159.16	44.98	204.14	675	0.16875	309.895	309.705	123.53	0.15	0.92	0.36	329.67	62%	125.52	
	4456	4384	S6002	7553	PWOPRSED0004605	Gravity	46.62	496.44	1882	11843	348	5180	17024	59.11	2.88	170.32	49.64	219.96	675	0.16875	309.705	309.575	105.52	0.12	0.82	0.36	295.04	75%	75.08	
Catchment Area 41	4384	6977	S6380	4770	PWOPRSED0004606	Gravity	46.62	496.44	1882	11843	348	5180	17024	59.11	2.88	170.32	49.64	219.96	675	0.16875	309.545	309.425	65.59	0.18	1.00	0.36	359.55	61%	139.58	
	6977	6978	S379	458	PWOPRSED0004591	Gravity	46.62	496.44	1882	11843	348	5180	17024	59.11	2.88	170.32	49.64	219.96	675	0.16875	309.4	309.35	26.42	0.19	1.02	0.36	365.68	60%	145.72	
	6978	4005	S1823	3484	PWOPRSED0006818	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	750	0.1875	309.355	309.345	3.4	0.29	1.37	0.44	603.76	40%	360.23	
	4005	4006	S6517	6832	PWOPRSIP0000041	siphon	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	121.76	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	40%	185.40	
	4005	4006	S839	925	PWOPRSIP0000040	siphon	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	121.76	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	40%	185.40	
	4006	4004	S5730	4828	PWOPRSED0006819	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	750	0.1875	309.155	309.145	4	0.25	1.26	0.44	556.64	44%	313.11	
	4004	4383	S6001	7552	PWOPRSED0004604	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.9	309.03	97.358	0.00	0.00	0.64	0.00		-243.52	*
	4383	4381	S5311	7612	PWOPRSED0004603	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.945	308.8	85.1	0.17	1.17	0.64	747.26	33%	503.74	
	4381	277	S2808	2883	PWOPRSED0004667	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.8	308.76	74.67	0.05	0.66	0.64	419.00	58%	175.47	
Catchment Area 53	277	98	S1958	2379	PWOPRSED0004668	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.76	308.695	76.55	0.08	0.83	0.64	527.52	46%	283.99	
	98	276	S147	137	PWOPRSED0004669	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.695	308.66	77.11	0.05	0.61	0.64	385.68	63%	142.16	
	276	4741	S4128	5188	PWOPRSED0004665	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.62	308.575	22.55	0.20	1.27	0.64	808.70	30%	565.17	
	4741	4740	S6511	6824	PWOPRSED0004666	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.575	308.46	68.51	0.17	1.17	0.64	741.69	33%	498.17	
	4740	4739	S3387	4303	PWOPRSED0004664	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.49	308.415	95.85	0.08	0.80	0.64	506.39	48%	262.87	
	4739	4738	S5719	7489	PWOPRSED0004661	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.35	308.405	50.87	0.00	0.00	0.64	0.00		-243.52	*
	4738	4737	S201	409	PWOPRSED0004662	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.405	308.19	107.59	0.20	1.27	0.64	809.26	30%	565.73	
	4737	4092	S1968	2390	PWOPRSED0004663	Gravity	54.16	550.60	639	12482	1326	6506	18988	65.93	2.86	188.47	55.06	243.52	900	0.225	308.19	308.355	30.76	0.00	0.00	0.64	0.00		-243.52	*
	4092	4376	S7500	5094		Gravity	28.20	578.79	736	13218	148	6655	19873	69.00	2.83	195.52	57.88	253.40	900	0.225	308.355	308.19	43.21	0.38	1.76	0.64	1118.67	23%	865.28	
Catchment Area 49	4376	4377	S5739	6449	PWOPRSED0004310	Gravity	28.20	578.79	736	13218	148	6655	19873	69.00	2.83	195.52	57.88	253.40	900	0.225	308.175	307.975	92.04	0.22	1.33	0.64	843.88	30%	590.48	
	4377	4378	S5740	6450	PWOPRSED0004311	Gravity	28.20	578.79	736	13218	148	6655	19873	69.00	2.83	195.52	57.88	253.40	900	0.225	307.975	307.89	30.54	0.28	1.50	0.64	955.05	27%	701.66	
CA 59 & 60	4378	6923	S792	861	PWOPRSED0004292	Gravity	55.25	634.04	1848	15066	697	7352	22417	77.84	2.78	216.10	63.40	279.51	600	0.15	307.89	307.805	228.29	0.04	0.42	0.28	118.48	236%	-161.03	
CA 54	6923	4483	S5147	6306	PWOPRSED0004259	Gravity	10.73	644.78	205	15271	110	7461	22732	78.93	2.77	218.67	64.48	283.15	675	0.16875	307.805	307.715	163.83	0.05	0.55	0.36	197.02	144%	-86.13	

2021 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID)		Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha)		POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections)					Average Flow L/s	Peaking Factor	Peak Flow L/s	Infiltration L/s	Q Total Flow Flow L/s	EXISTING SEWER									Percent Full	Reserve Capacity L/s	
	From	To					Catchment Area (ha)	Catchment Area - Accumulated (ha)	Residential		Employment		Total Accumulated Population	(Note 4)			(Note 3)		Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)			
									Population	Accumulated Population	Population	Accumulated Population																		
Catchment Area 56	4483	4482	S955	1026	PWOPRSED0004285	Gravity	13.41	658.18	536	15806	10	7471	23277	80.82	2.76	222.69	65.82	288.51	675	0.16875	307.715	307.585	89.76	0.14	0.89	0.36	319.90	90%	31.39	
82% of CA 46 & 47, 100% 43, 34, 40, 35,42	4482	2883	S6275	4736	PWOPRSED0004477	Gravity	289.74	947.93	9078	24884	2792	10262	35147	122.04	2.56	312.12	94.79	406.91	750	0.1875	307.585	307.445	159.31	0.09	0.75	0.44	330.02	123%		
	2883	229	S724	809	PWOPRSED0004426	Gravity	289.74	947.93	9078	24884	2792	10262	35147	122.04	2.56	312.12	94.79	406.91	750	0.1875	307.445	307.3	385.18	0.04	0.49	0.44	216.00	188%	-190.91	
	229	5450	S1066	1181	PWOPRSED0004414	Gravity	289.74	947.93	9078	24884	2792	10262	35147	122.04	2.56	312.12	94.79	406.91	750	0.1875	306.97	306.93	104.55	0.04	0.49	0.44	217.76	187%	-189.15	
	5450	5449	S2352	3898	PWOPRSED0004413	Gravity	289.74	947.93	9078	24884	2792	10262	35147	122.04	2.56	312.12	94.79	406.91	750	0.1875	306.95	306.93	15.39	0.13	0.91	0.44	401.33	101%	-5.58	
	5449	1776	S3037	3010	PWOPRSED0004412	Gravity	289.74	947.93	9078	24884	2792	10262	35147	122.04	2.56	312.12	94.79	406.91	750	0.1875	306.93	306.89	96.31	0.04	0.51	0.44	226.88	179%	-180.03	
	1776	1774	S1067	1182	PWOPRSED0004415	Gravity	289.74	947.93	9078	24884	2792	10262	35147	122.04	2.56	312.12	94.79	406.91	750	0.1875	306.89	306.7	95.09	0.20	1.13	0.44	497.64	82%	90.73	
CA 58	1774	1775	S3918	5968	PWOPRSED0004420	Gravity	156.92	1104.84	2816	27700	4017	14280	41979	145.76	2.51	366.06	110.48	476.55	750	0.1875	306.685	306.7	32.91	0.00	0.00	0.44	0.00		-476.55	*
	1775	1821	S2378	3387	PWOPRSED0004392	Gravity	156.92	1104.84	2816	27700	4017	14280	41979	145.76	2.51	366.06	110.48	476.55	750	0.1875	306.7	306.295	440.13	0.09	0.76	0.44	337.71	141%	-138.84	
CA 50, 57 & 18% of 46 & 47	1821	6199	S4046	2783	PWOPRSED0001960	Gravity	105.36	1210.20	3559	31259	648	14927	46186	160.37	2.46	394.46	121.02	515.48	900	0.225	306.095	305.36	651.2	0.11	0.96	0.64	608.19	85%	92.71	
	6199	823	S6061	4642	PWOPRSED0001845	Gravity	105.36	1210.20	3559	31259	648	14927	46186	160.37	2.46	394.46	121.02	515.48	900	0.225	305.36	305.115	219.36	0.11	0.95	0.64	605.00	85%	89.52	
	823	4822	S4577	5165	PWOPRSED0001999	Gravity	105.36	1210.20	3559	31259	648	14927	46186	160.37	2.46	394.46	121.02	515.48	900	0.225	305.115	304.89	193.79	0.12	0.97	0.64	616.85	84%	101.37	
	4822	680	S2912	3111	PWOPRSED0001897	Gravity	105.36	1210.20	3559	31259	648	14927	46186	160.37	2.46	394.46	121.02	515.48	900	0.225	304.89	304.72	245.88	0.07	0.75	0.64	476.01	108%	-39.47	
	680	679	S2095	2117	PWOPRSED0002949	Gravity	105.36	1210.20	3559	31259	648	14927	46186	160.37	2.46	394.46	121.02	515.48	900	0.225	304.72	304.615	71.48	0.15	1.09	0.64	693.83	74%	178.36	
	679	678	S2096	2118	PWOPRSED0002950	Gravity	105.36	1210.20	3559	31259	648	14927	46186	160.37	2.46	394.46	121.02	515.48	900	0.225	304.615	304.54	77.11	0.10	0.89	0.64	564.58	91%	49.10	
CA 72 & 74	new MH	678	n/a			Gravity	131.30	1341.50	2755	34014	938	15865	49879	173.19	2.42	419.79	134.15	553.95	450	0.1125	302.905	304.54	31	0.00	0.00	0.16	0.00		-553.95	*
	678	298	S2567	3438	PWOPRSED0005877	Gravity	131.30	1341.50	2755	34014	938	15865	49879	173.19	2.42	419.79	134.15	553.95	900	0.225	304.54	304.18	327.2	0.11	0.94	0.64	600.48	92%	46.53	
	298	731	S2609	3441	PWOPRSED0005878	Gravity	131.30	1341.50	2755	34014	938	15865	49879	173.19	2.42	419.79	134.15	553.95	1050	0.2625	304.18	303.5	434.95	0.16	1.25	0.87	1079.72	51%	525.78	
	731	374	S4353	5524	PWOPRSED0005921	Gravity	131.30	1341.50	2755	34014	938	15865	49879	173.19	2.42	419.79	134.15	553.95	1350	0.3375	303.5	303.49	6.2	0.16	1.50	1.43	2143.55	26%	1589.61	
CA 86	374	732	S4137	5479	PWOPRSED0005922	Gravity	11.90	1353.40	228	34242	0	15865	50106	173.98	2.42	421.22	135.34	556.56	1350	0.3375	303.49	303.49	64	0.00	0.00	1.43	0.00		-556.56	*
	732	733	S718	803	PWOPRSED0005923	Gravity	11.90	1353.40	228	34242	0	15865	50106	173.98	2.42	421.22	135.34	556.56	1350	0.3375	303.49	303.49	91	0.00	0.00	1.43	0.00		-556.56	*
	733	324	S4917	6546	PWOPRSED0005924	Gravity	11.90	1353.40	228	34242	0	15865	50106	173.98	2.42	421.22	135.34	556.56	1350	0.3375	303.49	303.32	68.5	0.25	1.86	1.43	2658.94	21%	2102.38	
Speed Trunk and Wellington Trunk	324	587	S684	848	PWOPRSED0005919	Gravity	1838.76	3192.16	48605	82846	31026	46891	129737	450.48	2.07	931.83	319.22	1251.04	1650	0.4125	303.32	303.22	98.8	0.10	1.36	2.14	2899.69	43%	1648.65	
	587	590	S3547	4061	PWOPRSED0005326	Gravity	1838.76	3192.16	48605	82846	31026	46891	129737	450.48	2.07	931.83	319.22	1251.04	1650	0.4125	303.285	303.235	112.65	0.04	0.90	2.14	1920.21	65%	669.17	
	590	4972	S1632	1937	PWOPRSIP0000043	siphon	1838.76	3192.16	48605	82846	31026	46891	129737	450.48	2.07	931.83	319.22	1251.04	1650	0.4125	303.235	303.205	31.6	0.09	1.31	2.14	2808.33	45%	1557.28	
	4972	1000	S1633	1938	PWOPRSED0005328	Gravity	1838.76	3192.16	48605	82846	31026	46891	129737	450.48	2.07	931.83	319.22	1251.04	1650	0.4125	303.155	303.13	74.82	0.03	0.78	2.14	1666.06	75%	415.02	^
	1001	2284	S1159	1312	PWOPRSED0005329	Gravity	1838.76	3192.16	48605	82846	31026	46891	129737	450.48	2.07	931.83	319.22	1251.04	1200	0.3	0	0	112.17	0.00	0.00	1.13	0.00		-1251.04	* ^
	1002	2284	S825	907	PWOPRSED0005330	Gravity	1838.76	3192.16	48605	82846	31026	46891	129737	450.48	2.07	931.83	319.22	1251.04	1200	0.3	303.125	302.849	112.16	0.25	1.71	1.13	1934.01	65%	682.97	^

* Pipe is at 0% or negative slope. For analysis all negative slopes were set to 0%

^ Manhole Id are unknown. Temporary placeholder provided as ID.

MUNICIPALITY: **City of Guelph**
PROJECT: **York Trunk Sewer Class EA**
FROM: **GENIVAR Inc.**
TO: **City of Guelph**

Legend
<50% Capacity
80%<100% Capacity
>100% Capacity
Flat Pipe or Pipe of Negative Slope

1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 4.5 m/s
3) Infiltration = 0.1 l/s/ha
4) Residential/ICI = 300 lpcd = 0.003472 L/cap/s
5) Manning; n = 0.013 for less than 1650mm and 0.011 for greater

2026 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID) From	Manhole (Object ID) To	Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha) Catchment Area (ha)	SERVICE AREA (ha) Catchment Area - Accumulated (ha)	POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections) Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population	Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)	Percent Full	Reserve Capacity L/s	
	Rockwood	4655	S5480	7668	PWOPRSED0006000	Gravity		0.00										34.72	300	0.075	331.43	330.96	96.93	0.48	0.95	0.07	67.34	52%	32.61	
	4655	4654	S4892	6225	PWOPRSED0004644	Gravity		0.00										34.72	300	0.075	330.9	330.67	47.24	0.49	0.95	0.07	67.47	51%	32.75	
Rockwood Flows	4654	4653	S6124	4968	PWOPRSED0004645	Gravity		0.00										34.72	300	0.075	330.575	329.96	120.09	0.51	0.98	0.07	69.20	50%	34.48	
	4653	4656	S1473	3655	PWOPRSED0004646	Gravity		0.00										34.72	300	0.075	329.96	329.375	119.79	0.49	0.96	0.07	67.58	51%	32.85	
	4656	6624	S2716	3209	PWOPRSED0004647	Gravity		0.00										34.72	300	0.075	333.51	329.115	49.81	8.82	4.06	0.07	287.24	12%	252.52	
	6624	4657	S465	587	PWOPRSED0004648	Gravity	18.68	18.68	322	35	638	638	673	0.00	4.34	0.00	0.00	34.72	300	0.075	329.115	328.75	70.4	0.52	0.99	0.07	69.63	50%	34.91	
	4657	5688	S2800	1898	PWOPRSED0004767	Gravity	18.68	18.68	322	322	638	638	961	0.00	4.06	0.00	0.00	34.72	300	0.075	328.75	325.755	87.48	3.42	2.53	0.07	178.93	19%	144.20	
Catchment Area 51	5688	5689	S4754	2750	PWOPRSED0004768	Gravity	18.68	18.68	322	322	638	638	961	0.00	4.06	0.00	0.00	34.72	300	0.075	325.755	322.97	82.78	3.36	2.51	0.07	177.37	20%	142.65	
	5689	5690	S4755	2751	PWOPRSED0004769	Gravity	18.68	18.68	322	322	638	638	961	0.00	4.06	0.00	0.00	34.72	300	0.075	322.97	321.335	80.62	2.03	1.95	0.07	137.71	25%	102.99	
	5690	5691	S2226	2464	PWOPRSED0004770	Gravity	18.68	18.68	322	322	638	638	961	0.00	4.06	0.00	0.00	34.72	300	0.075	321.335	319.69	80.47	2.04	1.96	0.07	138.26	25%	103.54	
Catchment Area 52	5691	1028	S1554	2514	PWOPRSED0004771	Gravity	76.15	94.83	1180	1503	2543	3181	4684	0.00	3.68	0.00	0.00	0.00	375	0.09375	319.69	316.475	8.5	37.82	9.76	0.11	1078.30	0%	1078.30	
	1028	4650	S4278	4667	PWOPRSED0004640	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	316.4	315.88	103.9	0.50	1.66	0.36	594.67	1%	587.37	
	4650	4651	S492	538	PWOPRSED0004641	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	315.805	315.565	19.2	1.25	2.63	0.36	939.81	1%	932.51	
	4651	4652	S5501	6131	PWOPRSED0004642	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	315.49	313.88	122.4	1.32	2.69	0.36	964.06	1%	956.76	
	4652	6616	S840	927	PWOPRSED0004643	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	311.055	310.94	82.3	0.14	0.88	0.36	314.22	2%	306.92	
Catchment Area 36,37,38, 39	6616	6617	S5055	6570	PWOPRSED0004617	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	310.94	310.78	83.06	0.19	1.03	0.36	368.93	2%	361.63	
	6617	6618	S5058	6573	PWOPRSED0004618	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	310.735	310.665	20.26	0.35	1.38	0.36	494.10	1%	486.80	
	6618	6619	S5059	6574	PWOPRSED0004619	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	310.59	310.465	91.44	0.14	0.87	0.36	310.79	2%	303.49	
	6619	6620	S2690	2621	PWOPRSED0004621	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	310.415	310.25	93.57	0.18	0.99	0.36	352.99	2%	345.69	
	6620	6612	S5060	6575	PWOPRSED0004620	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	310.22	310.075	101.41	0.14	0.89	0.36	317.85	2%	310.55	
	6612	767	S1682	3716	PWOPRSED0005966	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	310.075	309.895	99.33	0.18	1.00	0.36	357.83	2%	350.53	
	767	4456	S4234	5539	PWOPRSED0004611	Gravity	354.99	449.82	9877	11380	2428	5610	16990	0.00	2.90	7.30	0.00	7.30	675	0.16875	309.895	309.705	123.53	0.15	0.92	0.36	329.67	2%	322.37	
	4456	4384	S6002	7553	PWOPRSED0004605	Gravity	46.62	496.44	2072	13452	395	6004	19456	0.00	2.83	0.00	0.00	0.00	675	0.16875	309.705	309.575	105.52	0.12	0.82	0.36	295.04	0%	295.04	
Catchment Area 41	4384	6977	S6380	4770	PWOPRSED0004606	Gravity	46.62	496.44	2072	13452	395	6004	19456	0.00	2.83	0.00	0.00	0.00	675	0.16875	309.545	309.425	65.59	0.18	1.00	0.36	359.55	0%	359.55	
	6977	6978	S379	458	PWOPRSED0004591	Gravity	46.62	496.44	2072	13452	395	6004	19456	0.00	2.83	0.00	0.00	0.00	675	0.16875	309.4	309.35	26.42	0.19	1.02	0.36	365.68	0%	365.68	
	6978	4005	S1823	3484	PWOPRSED0006818	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	750	0.1875	309.355	309.345	3.4	0.29	1.37	0.44	603.76	0%	603.76	
	4005	4006	S6517	6832	PWOPRSIP0000041	siphon	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	0%	307.16	
	4005	4006	S839	925	PWOPRSIP0000040	siphon	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	0%	307.16	
	4006	4004	S5730	4828	PWOPRSED0006819	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	750	0.1875	309.155	309.145	4	0.25	1.26	0.44	556.64	0%	556.64	
	4004	4383	S6001	7552	PWOPRSED0004604	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.9	309.03	97.358	0.00	0.00	0.64	0.00		0.00	*
	4383	4381	S5311	7612	PWOPRSED0004603	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.945	308.8	85.1	0.17	1.17	0.64	747.26	0%	747.26	
	4381	277	S2808	2883	PWOPRSED0004667	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.8	308.76	74.67	0.05	0.66	0.64	419.00	0%	419.00	
Catchment Area 53	277	98	S1958	2379	PWOPRSED0004668	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.76	308.695	76.55	0.08	0.83	0.64	527.52	0%	527.52	
	98	276	S147	137	PWOPRSED0004669	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.695	308.66	77.11	0.05	0.61	0.64	385.68	0%	385.68	
	276	4741	S4128	5188	PWOPRSED0004665	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.62	308.575	22.55	0.20	1.27	0.64	808.70	0%	808.70	
	4741	4740	S6511	6824	PWOPRSED0004666	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.575	308.46	68.51	0.17	1.17	0.64	741.69	0%	741.69	
	4740	4739	S3387	4303	PWOPRSED0004664	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.49	308.415	95.85	0.08	0.80	0.64	506.39	0%	506.39	
	4739	4738	S5719	7489	PWOPRSED0004661	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.35	308.405	50.87	0.00	0.00	0.64	0.00		0.00	*
	4738	4737	S201	409	PWOPRSED0004662	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.405	308.19	107.59	0.20	1.27	0.64	809.26	0%	809.26	
	4737	4092	S1968	2390	PWOPRSED0004663	Gravity	54.16	550.60	798	14250	1527	7531	21782	0.00	2.80	0.00	0.00	0.00	900	0.225	308.19	308.355	30.76	0.00	0.00	0.64	0.00		0.00	*

2026 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID) From	Manhole (Object ID) To	Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha) Catchment Area (ha)	SERVICE AREA (ha) Catchment Area - Accumulated (ha)	POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections) Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population	Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)	Percent Full	Reserve Capacity L/s	
Catchment Area 49	4092	4376	S7500	5094		Gravity	28.20	578.79	779	15029	153	7685	22714	0.00	2.78	0.00	0.00	0.00	900	0.225	308.355	308.19	43.21	0.38	1.76	0.64	1118.67	0%	1118.67	
	4376	4377	S5739	6449	PWOPRSED0004310	Gravity	28.20	578.79	779	15029	153	7685	22714	0.00	2.78	0.00	0.00	0.00	900	0.225	308.175	307.975	92.04	0.22	1.33	0.64	843.88	0%	843.88	
	4377	4378	S5740	6450	PWOPRSED0004311	Gravity	28.20	578.79	779	15029	153	7685	22714	0.00	2.78	0.00	0.00	0.00	900	0.225	307.975	307.89	30.54	0.28	1.50	0.64	955.05	0%	955.05	
CA 59 & 60	4378	6923	S792	861	PWOPRSED0004292	Gravity	55.25	634.04	2178	17207	780	8465	25672	0.00	2.72	0.00	0.00	0.00	600	0.15	307.89	307.805	228.29	0.04	0.42	0.28	118.48	0%	118.48	
CA 54	6923	4483	S5147	6306	PWOPRSED0004259	Gravity	10.73	644.78	215	17422	110	8575	25997	0.00	2.71	0.00	0.00	0.00	675	0.16875	307.805	307.715	163.83	0.05	0.55	0.36	197.02	0%	197.02	
Catchment Area 56	4483	4482	S955	1026	PWOPRSED0004285	Gravity	13.41	658.18	603	18025	10	8584	26609	0.00	2.70	0.00	0.00	0.00	675	0.16875	307.715	307.585	89.76	0.14	0.89	0.36	319.90	0%	319.90	
82% of CA 46 & 47, 100% 43, 34, 40, 35,42	4482	2883	S6275	4736	PWOPRSED0004477	Gravity	289.74	947.93	9682	27707	2933	11517	39224	0.00	2.51	0.00	0.00	0.00	750	0.1875	307.585	307.445	159.31	0.09	0.75	0.44	330.02	0%		
	2883	229	S724	809	PWOPRSED0004426	Gravity	289.74	947.93	9682	27707	2933	11517	39224	0.00	2.51	0.00	0.00	0.00	750	0.1875	307.445	307.3	385.18	0.04	0.49	0.44	216.00	0%	216.00	
	229	5450	S1066	1181	PWOPRSED0004414	Gravity	289.74	947.93	9682	27707	2933	11517	39224	0.00	2.51	0.00	0.00	0.00	750	0.1875	306.97	306.93	104.55	0.04	0.49	0.44	217.76	0%	217.76	
	5450	5449	S2352	3898	PWOPRSED0004413	Gravity	289.74	947.93	9682	27707	2933	11517	39224	0.00	2.51	0.00	0.00	0.00	750	0.1875	306.95	306.93	15.39	0.13	0.91	0.44	401.33	0%	401.33	
	5449	1776	S3037	3010	PWOPRSED0004412	Gravity	289.74	947.93	9682	27707	2933	11517	39224	0.00	2.51	0.00	0.00	0.00	750	0.1875	306.93	306.89	96.31	0.04	0.51	0.44	226.88	0%	226.88	
	1776	1774	S1067	1182	PWOPRSED0004415	Gravity	289.74	947.93	9682	27707	2933	11517	39224	0.00	2.51	0.00	0.00	0.00	750	0.1875	306.89	306.7	95.09	0.20	1.13	0.44	497.64	0%	497.64	
CA 58	1774	1775	S3918	5968	PWOPRSED0004420	Gravity	156.92	1104.84	3366	31073	4154	15671	46744	0.00	2.46	0.00	0.00	0.00	750	0.1875	306.685	306.7	32.91	0.00	0.00	0.44	0.00		0.00	*
	1775	1821	S2378	3387	PWOPRSED0004392	Gravity	156.92	1104.84	3366	31073	4154	15671	46744	0.00	2.46	0.00	0.00	0.00	750	0.1875	306.7	306.295	440.13	0.09	0.76	0.44	337.71	0%	337.71	
CA 50, 57 & 18% of 46 & 47	1821	6199	S4046	2783	PWOPRSED0001960	Gravity	105.36	1210.20	3936	35009	665	16335	51344	0.00	2.41	0.00	0.00	0.00	900	0.225	306.095	305.36	651.2	0.11	0.96	0.64	608.19	0%	608.19	
	6199	823	S6061	4642	PWOPRSED0001845	Gravity	105.36	1210.20	3936	35009	665	16335	51344	0.00	2.41	0.00	0.00	0.00	900	0.225	305.36	305.115	219.36	0.11	0.95	0.64	605.00	0%	605.00	
	823	4822	S4577	5165	PWOPRSED0001999	Gravity	105.36	1210.20	3936	35009	665	16335	51344	0.00	2.41	0.00	0.00	0.00	900	0.225	305.115	304.89	193.79	0.12	0.97	0.64	616.85	0%	616.85	
	4822	680	S2912	3111	PWOPRSED0001897	Gravity	105.36	1210.20	3936	35009	665	16335	51344	0.00	2.41	0.00	0.00	0.00	900	0.225	304.89	304.72	245.88	0.07	0.75	0.64	476.01	0%	476.01	
	680	679	S2095	2117	PWOPRSED0002949	Gravity	105.36	1210.20	3936	35009	665	16335	51344	0.00	2.41	0.00	0.00	0.00	900	0.225	304.72	304.615	71.48	0.15	1.09	0.64	693.83	0%	693.83	
	679	678	S2096	2118	PWOPRSED0002950	Gravity	105.36	1210.20	3936	35009	665	16335	51344	0.00	2.41	0.00	0.00	0.00	900	0.225	304.615	304.54	77.11	0.10	0.89	0.64	564.58	0%	564.58	
CA 72 & 74	new MH	678	n/a			Gravity	131.30	1341.50	2869	37878	966	17301	55179	0.00	2.38	0.00	0.00	0.00	450	0.1125	302.905	304.54	31	0.00	0.00	0.16	0.00		0.00	*
	678	298	S2567	3438	PWOPRSED0005877	Gravity	131.30	1341.50	2869	37878	966	17301	55179	0.00	2.38	0.00	0.00	0.00	900	0.225	304.54	304.18	327.2	0.11	0.94	0.64	600.48	0%	600.48	
	298	731	S2609	3441	PWOPRSED0005878	Gravity	131.30	1341.50	2869	37878	966	17301	55179	0.00	2.38	0.00	0.00	0.00	1050	0.2625	304.18	303.5	434.95	0.16	1.25	0.87	1079.72	0%	1079.72	
	731	374	S4353	5524	PWOPRSED0005921	Gravity	131.30	1341.50	2869	37878	966	17301	55179	0.00	2.38	0.00	0.00	0.00	1350	0.3375	303.5	303.49	6.2	0.16	1.50	1.43	2143.55	0%	2143.55	
CA 86	374	732	S4137	5479	PWOPRSED0005922	Gravity	11.90	1353.40	239	38117	0	17301	55418	0.00	2.38	0.00	0.00	0.00	1350	0.3375	303.49	303.49	64	0.00	0.00	1.43	0.00		0.00	*
	732	733	S718	803	PWOPRSED0005923	Gravity	11.90	1353.40	239	38117	0	17301	55418	0.00	2.38	0.00	0.00	0.00	1350	0.3375	303.49	303.49	91	0.00	0.00	1.43	0.00		0.00	*
	733	324	S4917	6546	PWOPRSED0005924	Gravity	11.90	1353.40	239	38117	0	17301	55418	0.00	2.38	0.00	0.00	0.00	1350	0.3375	303.49	303.32	68.5	0.25	1.86	1.43	2658.94	0%	2658.94	
Speed Trunk and Wellington Trunk	324	587	S684	848	PWOPRSED0005919	Gravity	1838.76	3192.16	52343	90460	32278	49580	140039	0.00	2.04	0.00	0.00	0.00	1650	0.4125	303.32	303.22	98.8	0.10	1.36	2.14	2899.69	0%	2899.69	
	587	590	S3547	4061	PWOPRSED0005326	Gravity	1838.76	3192.16	52343	90460	32278	49580	140039	0.00	2.04	0.00	0.00	0.00	1650	0.4125	303.285	303.235	112.65	0.04	0.90	2.14	1920.21	0%	1920.21	
	590	4972	S1632	1937	PWOPRSIP0000043	siphon	1838.76	3192.16	52343	90460	32278	49580	140039	0.00	2.04	0.00	0.00	0.00	1650	0.4125	303.235	303.205	31.6	0.09	1.31	2.14	2808.33	0%	2808.33	
	4972	1000	S1633	1938	PWOPRSED0005328	Gravity	1838.76	3192.16	52343	90460	32278	49580	140039	0.00	2.04	0.00	0.00	0.00	1650	0.4125	303.155	303.13	74.82	0.03	0.78	2.14	1666.06	0%	1666.06	^
	1001	2284	S1159	1312	PWOPRSED0005329	Gravity	1838.76	3192.16	52343	90460	32278	49580	140039	0.00	2.04	0.00	0.00	0.00	1200	0.3	0	0	112.17	0.00	0.00	1.13	0.00		0.00	* ^
	1002	2284	S825	907	PWOPRSED0005330	Gravity	1838.76	3192.16	52343	90460	32278	49580	140039	0.00	2.04	0.00	0.00	0.00	1200	0.3	303.125	302.849	112.16	0.25	1.71	1.13	1934.01	0%	1934.01	^

* Pipe is at 0% or negative slope. For analysis all negative slopes were set to 0%

^ Manhole Id are unknown. Temporary placeholder provided as ID.

MUNICIPALITY: **City of Guelph**
PROJECT: **York Trunk Sewer Class EA**
FROM: **GENIVAR Inc.**
TO: **City of Guelph**

Legend
<50% Capacity
80%<100% Capacity
>100% Capacity
Flat Pipe or Pipe of Negative Slope

1) MINIMUM VELOCITY = 0.60 m/s
2) MAXIMUM VELOCITY = 4.5 m/s
3) Infiltration = 0.1 l/s/ha
4) Residential/ICI = 300 lpcd = 0.003472 L/cap/s
5) Manning; n = 0.013 for less than 1650mm and 0.011 for greater

2031 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID) From	Manhole (Object ID) To	Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha) Catchment Area (ha)	SERVICE AREA (ha) Catchment Area - Accumulated (ha)	POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections) Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population	Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)	Percent Full	Reserve Capacity L/s	
	Rockwood	4655	S5480	7668	PWOPRSED0006000	Gravity		0.00										34.72	300	0.075	331.43	330.96	96.93	0.48	0.95	0.07	67.34	52%	32.61	
	4655	4654	S4892	6225	PWOPRSED0004644	Gravity		0.00										34.72	300	0.075	330.9	330.67	47.24	0.49	0.95	0.07	67.47	51%	32.75	
Rockwood Flows	4654	4653	S6124	4968	PWOPRSED0004645	Gravity		0.00										34.72	300	0.075	330.575	329.96	120.09	0.51	0.98	0.07	69.20	50%	34.48	
	4653	4656	S1473	3655	PWOPRSED0004646	Gravity		0.00										34.72	300	0.075	329.96	329.375	119.79	0.49	0.96	0.07	67.58	51%	32.85	
	4656	6624	S2716	3209	PWOPRSED0004647	Gravity		0.00										34.72	300	0.075	333.51	329.115	49.81	8.82	4.06	0.07	287.24	12%	252.52	
	6624	4657	S465	587	PWOPRSED0004648	Gravity	18.68	18.68	394	394	728	728	1122	3.90	4.03	15.68	1.87	52.27	300	0.075	329.115	328.75	70.4	0.52	0.99	0.07	69.63	75%	17.36	
	4657	5688	S2800	1898	PWOPRSED0004767	Gravity	18.68	18.68	394	394	728	728	1122	3.90	4.03	15.68	1.87	52.27	300	0.075	328.75	325.755	87.48	3.42	2.53	0.07	178.93	29%	126.65	
Catchment Area 51	5688	5689	S4754	2750	PWOPRSED0004768	Gravity	18.68	18.68	394	394	728	728	1122	3.90	4.03	15.68	1.87	52.27	300	0.075	325.755	322.97	82.78	3.36	2.51	0.07	177.37	29%	125.10	
	5689	5690	S4755	2751	PWOPRSED0004769	Gravity	18.68	18.68	394	394	728	728	1122	3.90	4.03	15.68	1.87	52.27	300	0.075	322.97	321.335	80.62	2.03	1.95	0.07	137.71	38%	85.44	
	5690	5691	S2226	2464	PWOPRSED0004770	Gravity	18.68	18.68	394	394	728	728	1122	3.90	4.03	15.68	1.87	52.27	300	0.075	321.335	319.69	80.47	2.04	1.96	0.07	138.26	38%	85.99	
Catchment Area 52	5691	1028	S1554	2514	PWOPRSED0004771	Gravity	76.15	94.83	1457	1852	2899	3627	5479	19.02	3.61	68.70	9.48	78.19	375	0.09375	319.69	316.475	8.5	37.82	9.76	0.11	1078.30	7%	1000.11	
	1028	4650	S4278	4667	PWOPRSED0004640	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	316.4	315.88	103.9	0.50	1.66	0.36	594.67	41%	352.70	
	4650	4651	S492	538	PWOPRSED0004641	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	315.805	315.565	19.2	1.25	2.63	0.36	939.81	26%	697.83	
	4651	4652	S5501	6131	PWOPRSED0004642	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	315.49	313.88	122.4	1.32	2.69	0.36	964.06	25%	722.09	
	4652	6616	S840	927	PWOPRSED0004643	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	311.055	310.94	82.3	0.14	0.88	0.36	314.22	77%	72.25	
Catchment Area 36,37,38, 39	6616	6617	S5055	6570	PWOPRSED0004617	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	310.94	310.78	83.06	0.19	1.03	0.36	368.93	66%	126.96	
	6617	6618	S5058	6573	PWOPRSED0004618	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	310.735	310.665	20.26	0.35	1.38	0.36	494.10	49%	252.12	
	6618	6619	S5059	6574	PWOPRSED0004619	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	310.59	310.465	91.44	0.14	0.87	0.36	310.79	78%	68.82	
	6619	6620	S2690	2621	PWOPRSED0004621	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	310.415	310.25	93.57	0.18	0.99	0.36	352.99	69%	111.01	
	6620	6612	S5060	6575	PWOPRSED0004620	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	310.22	310.075	101.41	0.14	0.89	0.36	317.85	76%	75.88	
	6612	767	S1682	3716	PWOPRSED0005966	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	310.075	309.895	99.33	0.18	1.00	0.36	357.83	68%	115.86	
	767	4456	S4234	5539	PWOPRSED0004611	Gravity	354.99	449.82	10947	12799	2759	6386	19185	66.62	2.85	196.99	44.98	241.97	675	0.16875	309.895	309.705	123.53	0.15	0.92	0.36	329.67	73%	87.69	
	4456	4384	S6002	7553	PWOPRSED0004605	Gravity	46.62	496.44	2262	15061	442	6828	21889	76.00	2.78	211.02	49.64	260.66	675	0.16875	309.705	309.575	105.52	0.12	0.82	0.36	295.04	88%	34.38	
Catchment Area 41	4384	6977	S6380	4770	PWOPRSED0004606	Gravity	46.62	496.44	2262	15061	442	6828	21889	76.00	2.78	211.02	49.64	260.66	675	0.16875	309.545	309.425	65.59	0.18	1.00	0.36	359.55	72%	98.88	
	6977	6978	S379	458	PWOPRSED0004591	Gravity	46.62	496.44	2262	15061	442	6828	21889	76.00	2.78	211.02	49.64	260.66	675	0.16875	309.4	309.35	26.42	0.19	1.02	0.36	365.68	71%	105.02	
	6978	4005	S1823	3484	PWOPRSED0006818	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	750	0.1875	309.355	309.345	3.4	0.29	1.37	0.44	603.76	48%	314.08	
	4005	4006	S6517	6832	PWOPRSIP0000041	siphon	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	144.84	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	47%	162.33	
	4005	4006	S839	925	PWOPRSIP0000040	siphon	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	144.84	450	0.1125	309.33	309.2	11.2	1.16	1.93	0.16	307.16	47%	162.33	
	4006	4004	S5730	4828	PWOPRSED0006819	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	750	0.1875	309.155	309.145	4	0.25	1.26	0.44	556.64	52%	266.96	
	4004	4383	S6001	7552	PWOPRSED0004604	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.9	309.03	97.358	0.00	0.00	0.64	0.00		-289.68	*
	4383	4381	S5311	7612	PWOPRSED0004603	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.945	308.8	85.1	0.17	1.17	0.64	747.26	39%	457.59	
	4381	277	S2808	2883	PWOPRSED0004667	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.8	308.76	74.67	0.05	0.66	0.64	419.00	69%	129.32	
Catchment Area 53	277	98	S1958	2379	PWOPRSED0004668	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.76	308.695	76.55	0.08	0.83	0.64	527.52	55%	237.84	
	98	276	S147	137	PWOPRSED0004669	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.695	308.66	77.11	0.05	0.61	0.64	385.68	75%	96.01	
	276	4741	S4128	5188	PWOPRSED0004665	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.62	308.575	22.55	0.20	1.27	0.64	808.70	36%	519.02	
	4741	4740	S6511	6824	PWOPRSED0004666	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.575	308.46	68.51	0.17	1.17	0.64	741.69	39%	452.02	
	4740	4739	S3387	4303	PWOPRSED0004664	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.49	308.415	95.85	0.08	0.80	0.64	506.39	57%	216.72	
	4739	4738	S5719	7489	PWOPRSED0004661	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.35	308.405	50.87	0.00	0.00	0.64	0.00		-289.68	*
	4738	4737	S201	409	PWOPRSED0004662	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.405	308.19	107.59	0.20	1.27	0.64	809.26	36%	519.58	
	4737	4092	S1968	2390	PWOPRSED0004663	Gravity	54.16	550.60	958	16019	1728	8557	24575	85.33	2.75	234.62	55.06	289.68	900	0.225	308.19	308.355	30.76	0.00	0.00	0.64	0.00		-289.68	*
	4092	4376	S7500	5094		Gravity	28.20	578.79	822	16840	158	8715	25555	88.73	2.73	242.03	57.88	299.91	900	0.225	308.355	308.19	43.21	0.38	1.76	0.64	1118.67	27%	818.76	
Catchment Area 49	4376	4377	S5739	6449	PWOPRSED0004310	Gravity	28.20	578.79	822	16840	158	8715	25555	88.73	2.73	242.03	57.88	299.91	900	0.225	308.175	307.975	92.04	0.22	1.33	0.64	843.88	36%	543.97	
	4377	4378	S5740	6450	PWOPRSED0004311	Gravity	28.20	578.79	822	16840	158	8715	25555	88.73	2.73	242.03	57.88	299.91	900	0.225	307.975	307.89	30.54	0.28	1.50	0.64	955.05	31%	655.15	
CA 59 & 60	4378	6923	S792	861	PWOPRSED0004292	Gravity	55.25	634.04	2509	19349	864	9578	28927	100.44	2.67	267.87	63.40	331.28	600	0.15	307.89	307.805	228.29	0.04	0.42	0.28	118.48	280%	-212.80	
CA 54	6923	4483	S5147	6306	PWOPRSED0004259	Gravity	10.73	644.78	225	19574	109	9688	29261	101.60	2.66	270.45	64.48	334.93	675	0.16875	307.805	307.715	163.83	0.05	0.55	0.36	197.02	170%	-137.91	

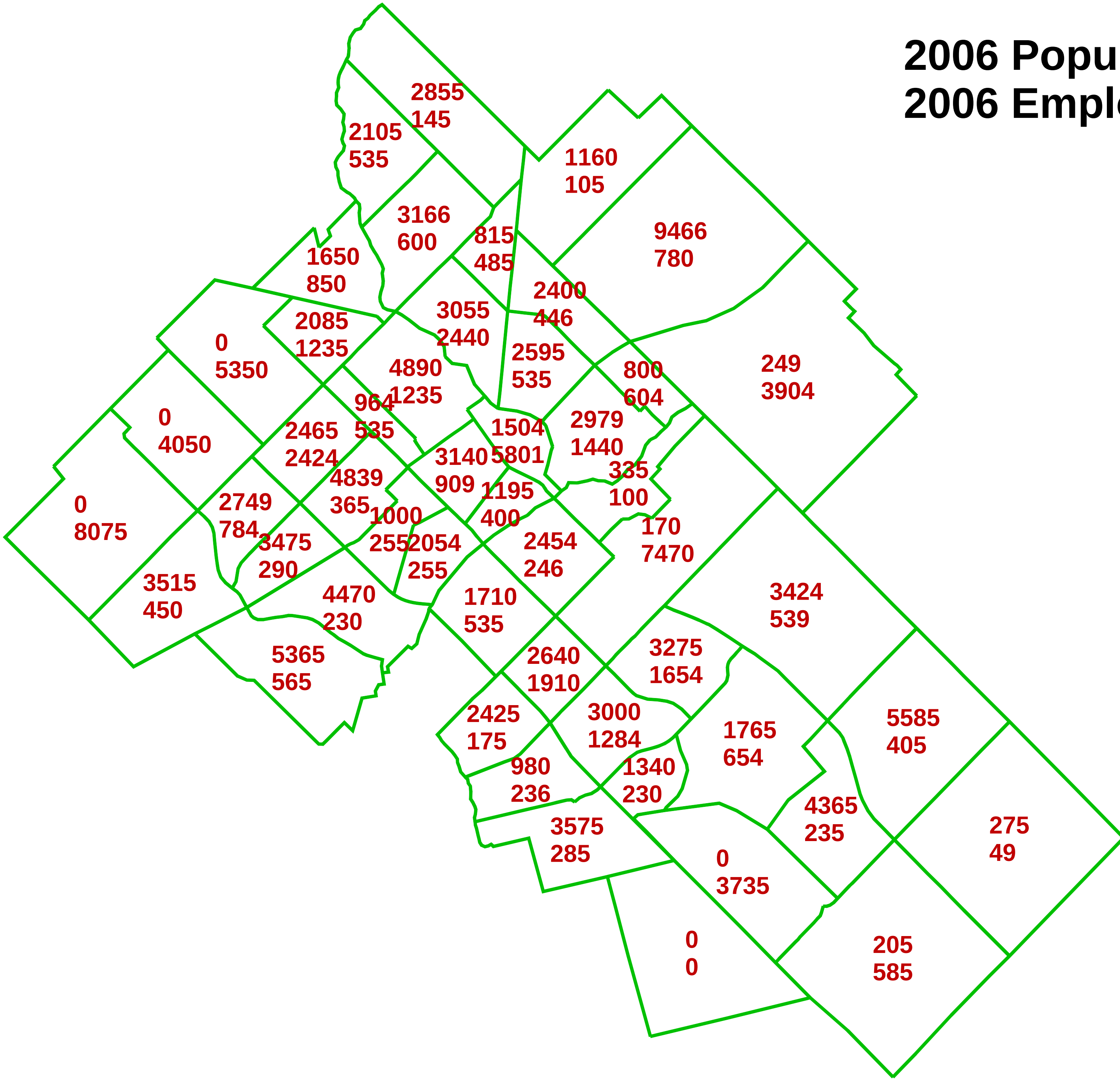
2031 Population Horizon

SERVICE AREA DESCRIPTION	Manhole (Object ID) From	Manhole (Object ID) To	Unique Pipe ID	Pipe Segment (Object ID)	Pipe Segment (Asset ID)	Type	SERVICE AREA (ha) Catchment Area (ha)	SERVICE AREA (ha) Catchment Area - Accumulated (ha)	POPULATION TRIBUTARY (2031 Traffic Zone Pop Projections) Residential Population	Residential Accumulated Population	Employment Population	Employment Accumulated Population	Total Accumulated Population	Average Flow L/s (Note 4)	Peaking Factor	Peak Flow L/s	Infiltration L/s (Note 3)	Q Total Flow Flow L/s	EXISTING SEWER Existing Pipe Size (mm)	Hydraulic Radius (m)	Up Invert (m)	Down Invert (m)	Length (m)	Slope (%)	V (m/s)	Cross Sectional Area (m2)	Q pipe (L/s)	Percent Full	Reserve Capacity L/s	
Catchment Area 56	4483	4482	S955	1026	PWOPRSED0004285	Gravity	13.41	658.18	671	20244	9	9697	29941	103.96	2.65	275.21	65.82	341.03	675	0.16875	307.715	307.585	89.76	0.14	0.89	0.36	319.90	107%	-21.13	
82% of CA 46 & 47, 100% 43, 34, 40, 35,42	4482	2883	S6275	4736	PWOPRSED0004477	Gravity	289.74	947.93	10286	30530	3074	12772	43302	150.35	2.47	371.33	94.79	466.13	750	0.1875	307.585	307.445	159.31	0.09	0.75	0.44	330.02	141%		
	2883	229	S724	809	PWOPRSED0004426	Gravity	289.74	947.93	10286	30530	3074	12772	43302	150.35	2.47	371.33	94.79	466.13	750	0.1875	307.445	307.3	385.18	0.04	0.49	0.44	216.00	216%	-250.13	
	229	5450	S1066	1181	PWOPRSED0004414	Gravity	289.74	947.93	10286	30530	3074	12772	43302	150.35	2.47	371.33	94.79	466.13	750	0.1875	306.97	306.93	104.55	0.04	0.49	0.44	217.76	214%	-248.37	
	5450	5449	S2352	3898	PWOPRSED0004413	Gravity	289.74	947.93	10286	30530	3074	12772	43302	150.35	2.47	371.33	94.79	466.13	750	0.1875	306.95	306.93	15.39	0.13	0.91	0.44	401.33	116%	-64.80	
	5449	1776	S3037	3010	PWOPRSED0004412	Gravity	289.74	947.93	10286	30530	3074	12772	43302	150.35	2.47	371.33	94.79	466.13	750	0.1875	306.93	306.89	96.31	0.04	0.51	0.44	226.88	205%	-239.25	
	1776	1774	S1067	1182	PWOPRSED0004415	Gravity	289.74	947.93	10286	30530	3074	12772	43302	150.35	2.47	371.33	94.79	466.13	750	0.1875	306.89	306.7	95.09	0.20	1.13	0.44	497.64	94%	31.51	
CA 58	1774	1775	S3918	5968	PWOPRSED0004420	Gravity	156.92	1104.84	3916	34446	4290	17062	51508	178.85	2.42	432.55	110.48	543.04	750	0.1875	306.685	306.7	32.91	0.00	0.00	0.44	0.00		-543.04	*
	1775	1821	S2378	3387	PWOPRSED0004392	Gravity	156.92	1104.84	3916	34446	4290	17062	51508	178.85	2.42	432.55	110.48	543.04	750	0.1875	306.7	306.295	440.13	0.09	0.76	0.44	337.71	161%	-205.33	
CA 50, 57 & 18% of 46 & 47	1821	6199	S4046	2783	PWOPRSED0001960	Gravity	105.36	1210.20	4313	38759	682	17744	56502	196.19	2.37	464.79	121.02	585.81	900	0.225	306.095	305.36	651.2	0.11	0.96	0.64	608.19	96%	22.38	
	6199	823	S6061	4642	PWOPRSED0001845	Gravity	105.36	1210.20	4313	38759	682	17744	56502	196.19	2.37	464.79	121.02	585.81	900	0.225	305.36	305.115	219.36	0.11	0.95	0.64	605.00	97%	19.19	
	823	4822	S4577	5165	PWOPRSED0001999	Gravity	105.36	1210.20	4313	38759	682	17744	56502	196.19	2.37	464.79	121.02	585.81	900	0.225	305.115	304.89	193.79	0.12	0.97	0.64	616.85	95%	31.04	
	4822	680	S2912	3111	PWOPRSED0001897	Gravity	105.36	1210.20	4313	38759	682	17744	56502	196.19	2.37	464.79	121.02	585.81	900	0.225	304.89	304.72	245.88	0.07	0.75	0.64	476.01	123%	-109.80	
	680	679	S2095	2117	PWOPRSED0002949	Gravity	105.36	1210.20	4313	38759	682	17744	56502	196.19	2.37	464.79	121.02	585.81	900	0.225	304.72	304.615	71.48	0.15	1.09	0.64	693.83	84%	108.02	
	679	678	S2096	2118	PWOPRSED0002950	Gravity	105.36	1210.20	4313	38759	682	17744	56502	196.19	2.37	464.79	121.02	585.81	900	0.225	304.615	304.54	77.11	0.10	0.89	0.64	564.58	104%	-21.23	
CA 72 & 74	new MH	678	n/a			Gravity	131.30	1341.50	2982	41741	994	18738	60479	210.00	2.34	491.04	134.15	625.19	450	0.1125	302.905	304.54	31	0.00	0.00	0.16	0.00		-625.19	*
	678	298	S2567	3438	PWOPRSED0005877	Gravity	131.30	1341.50	2982	41741	994	18738	60479	210.00	2.34	491.04	134.15	625.19	900	0.225	304.54	304.18	327.2	0.11	0.94	0.64	600.48	104%	-24.71	
	298	731	S2609	3441	PWOPRSED0005878	Gravity	131.30	1341.50	2982	41741	994	18738	60479	210.00	2.34	491.04	134.15	625.19	1050	0.2625	304.18	303.5	434.95	0.16	1.25	0.87	1079.72	58%	454.53	
	731	374	S4353	5524	PWOPRSED0005921	Gravity	131.30	1341.50	2982	41741	994	18738	60479	210.00	2.34	491.04	134.15	625.19	1350	0.3375	303.5	303.49	6.2	0.16	1.50	1.43	2143.55	29%	1518.36	
CA 86	374	732	S4137	5479	PWOPRSED0005922	Gravity	11.90	1353.40	250	41991	0	18738	60729	210.87	2.34	492.55	135.34	627.89	1350	0.3375	303.49	303.49	64	0.00	0.00	1.43	0.00		-627.89	*
	732	733	S718	803	PWOPRSED0005923	Gravity	11.90	1353.40	250	41991	0	18738	60729	210.87	2.34	492.55	135.34	627.89	1350	0.3375	303.49	303.49	91	0.00	0.00	1.43	0.00		-627.89	*
	733	324	S4917	6546	PWOPRSED0005924	Gravity	11.90	1353.40	250	41991	0	18738	60729	210.87	2.34	492.55	135.34	627.89	1350	0.3375	303.49	303.32	68.5	0.25	1.86	1.43	2658.94	24%	2031.05	
Speed Trunk and Wellington Trunk	324	587	S684	848	PWOPRSED0005919	Gravity	1838.76	3192.16	56081	98073	33531	52269	150341	522.02	2.01	1047.67	319.22	1366.89	1650	0.4125	303.32	303.22	98.8	0.10	1.36	2.14	2899.69	47%	1532.80	
	587	590	S3547	4061	PWOPRSED0005326	Gravity	1838.76	3192.16	56081	98073	33531	52269	150341	522.02	2.01	1047.67	319.22	1366.89	1650	0.4125	303.285	303.235	112.65	0.04	0.90	2.14	1920.21	71%	553.33	
	590	4972	S1632	1937	PWOPRSIP0000043	siphon	1838.76	3192.16	56081	98073	33531	52269	150341	522.02	2.01	1047.67	319.22	1366.89	1650	0.4125	303.235	303.205	31.6	0.09	1.31	2.14	2808.33	49%	1441.44	
	4972	1000	S1633	1938	PWOPRSED0005328	Gravity	1838.76	3192.16	56081	98073	33531	52269	150341	522.02	2.01	1047.67	319.22	1366.89	1650	0.4125	303.155	303.13	74.82	0.03	0.78	2.14	1666.06	82%	299.18	^
	1001	2284	S1159	1312	PWOPRSED0005329	Gravity	1838.76	3192.16	56081	98073	33531	52269	150341	522.02	2.01	1047.67	319.22	1366.89	1200	0.3	0	0	112.17	0.00	0.00	1.13	0.00		-1366.89	* ^
	1002	2284	S825	907	PWOPRSED0005330	Gravity	1838.76	3192.16	56081	98073	33531	52269	150341	522.02	2.01	1047.67	319.22	1366.89	1200	0.3	303.125	302.849	112.16	0.25	1.71	1.13	1934.01	71%	567.12	^

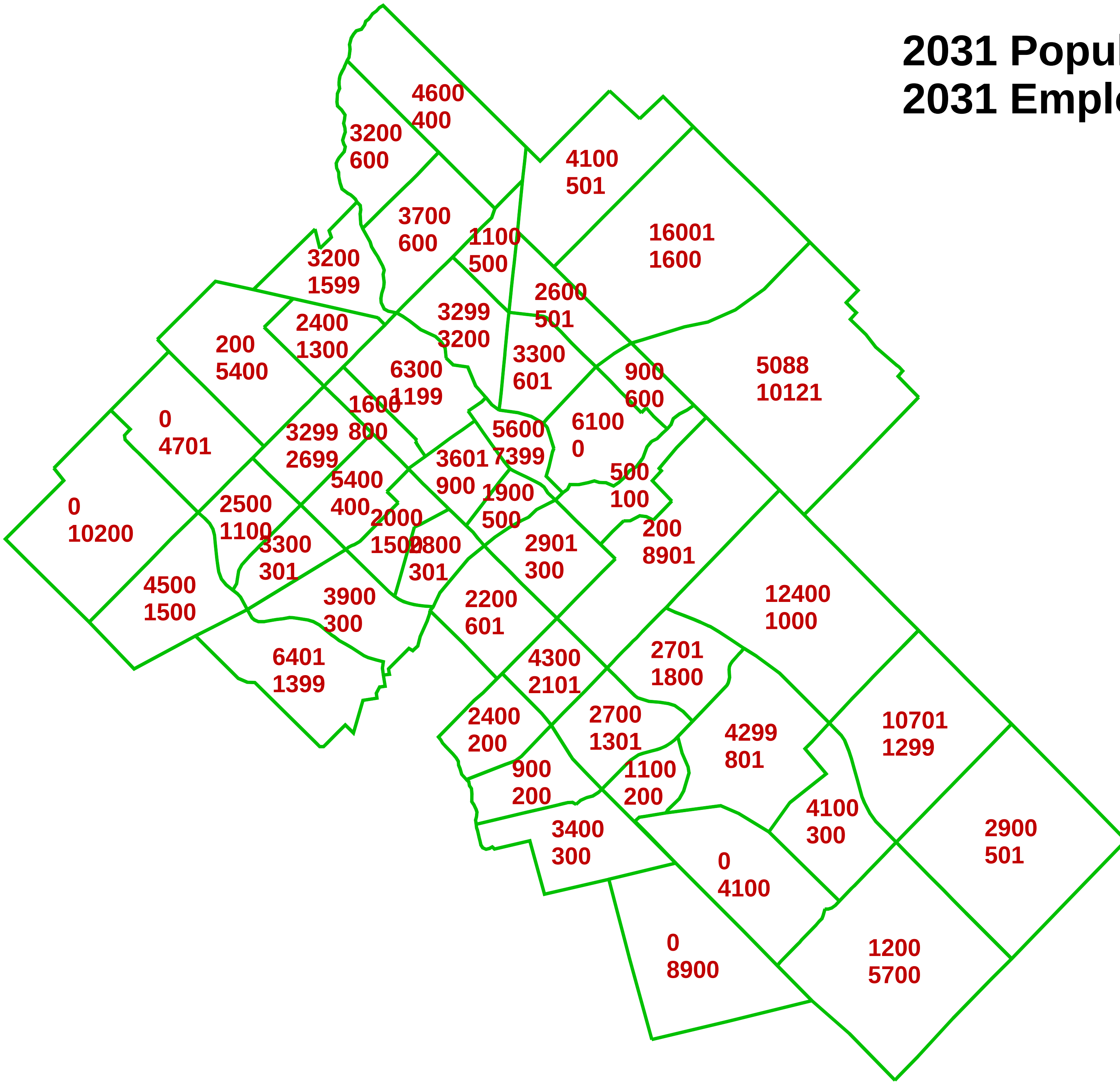
* Pipe is at 0% or negative slope. For analysis all negative slopes were set to 0%

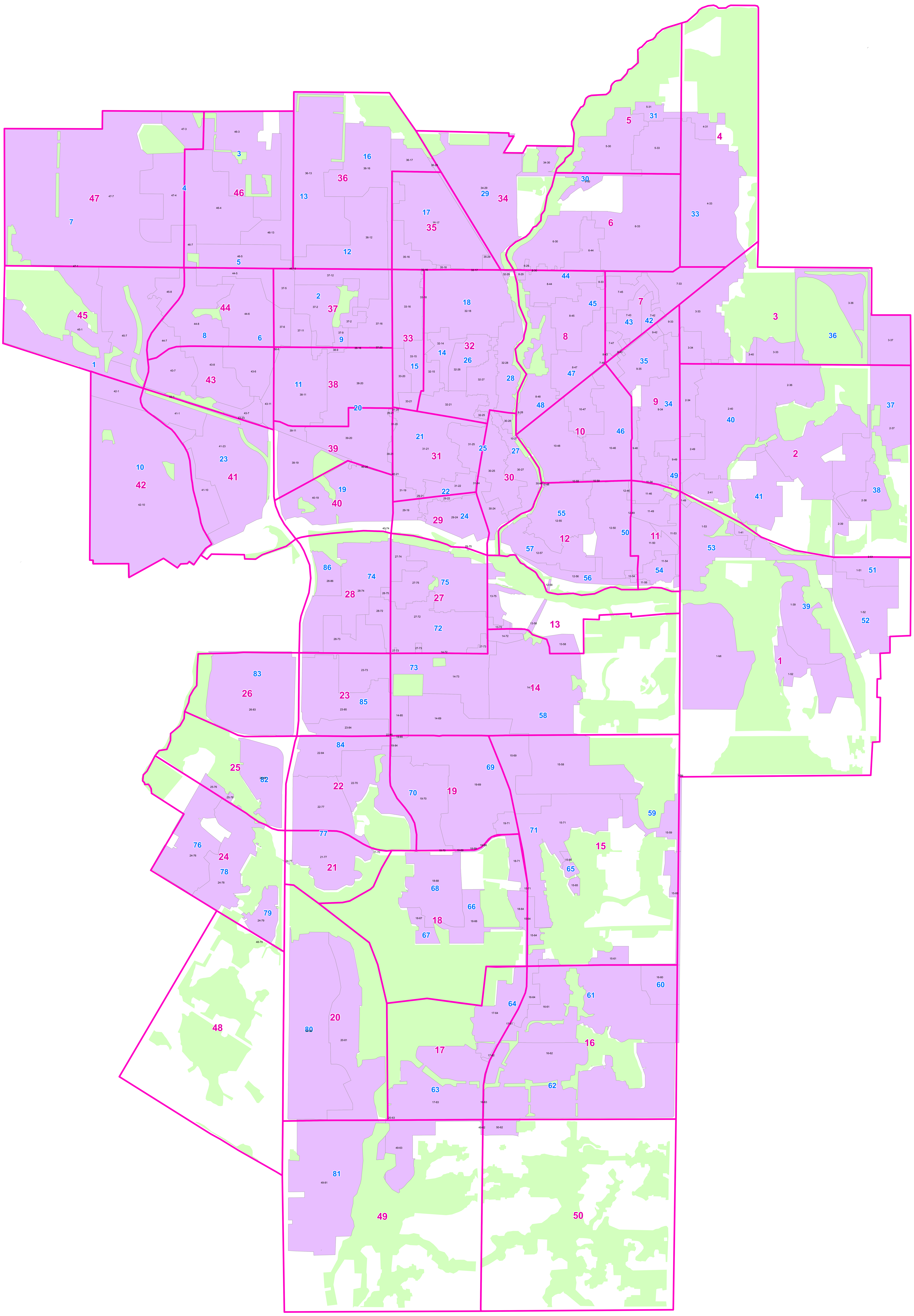
^ Manhole Id are unknown. Temporary placeholder provided as ID.

2006 Population
2006 Employment



2031 Population
2031 Employment





Legend

- Traffic Zone
- Natural Heritage System
- Traffic Zones and Catchment Areas Subtract Natural Heritage System

Appendix B

Archaeological Assessment Report

Archaeological Research Associates Ltd.

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DRAFT

Stage 1 Archaeological Assessment
York Trunk Sewer and Paisley-Clythe Feedermain
City of Guelph
Wellington County, Ontario

Prepared for
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Ontario Ministry of Tourism and Culture Licence #P-007
Project #P007-272
PIF #P007-272-2010

November 2010

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Executive Summary:

In November of 2010, **Archaeological Research Associates Ltd. (ARA)** carried out a Stage 1 archaeological assessment of lands with the potential to be impacted by proposed improvements to the York Trunk Sewer and the construction of the Paisley-Clythe Feedermain in the City of Guelph, Ontario. The intent of this report is to assess the potential for cultural heritage sites, artifacts or features that may be present in areas that are to be impacted by these improvements.

The results of the Stage 1 assessment indicate that the study area, in its pristine state, would have a high potential for both Pre-Contact and Euro-Canadian archaeological sites. A property inspection was conducted on November 15th of 2010 to visually assess and document the archaeological potential of the study area in its current state. In the field it was noted that modern land-use has negatively impacted the archaeological potential in many parts of the study area, particularly in areas of previous infrastructural development. However, many areas of high and uncertain archaeological potential remain despite such activities. Accordingly, it is recommended that a Stage 2 archaeological assessment be carried out on all lands with archaeological potential that may be disturbed by the proposed project.

Personnel:

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Photography: C.E. Gohm
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Report Preparation: C.J. Gohm
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Acknowledgements:

Special thanks for his research assistance are extended to Mr. Robert Von Bitter, Archaeological Data Coordinator, Archaeology Unit, Heritage Branch, Ontario Ministry of Tourism and Culture, Toronto.

1.0 Introduction

Under a contract awarded in October of 2010, **Archaeological Research Associates Ltd. (ARA)** carried out a Stage 1 archaeological assessment of lands with the potential to be impacted by proposed upgrades to the York Trunk Sewer and the construction of the proposed Paisley-Clythe Feedermain in the City of Guelph, Ontario. The assessment was conducted in November of 2010 under licence #P-007, PIF #P007-272-2010. The work was completed under contract to **GENIVAR** as part of a Municipal Class Environmental Assessment (EA).

The Stage 1 archaeological assessment was carried out in order to:

- Locate and describe any registered archaeological sites that might be found near or within the study area;
- If identified, suggest appropriate strategies for the protection and management of these sites;
- Estimate the potential that further cultural resources might be present within the study area.

The assessment was conducted in accordance with the provisions of the *Ontario Heritage Act* (R.S.O. 1990), and *Draft Standards and Guidelines for Consultant Archaeologists* (Ontario Ministry of Culture 2009). All notes, photographs and records pertaining to this assessment are housed in a secure company storage facility located at 97 Gatewood Road, Kitchener, Ontario.

The Ministry of Tourism and Culture is asked to review the results and recommendations presented in this report.

2.0 Location

The study area consists of a corridor, roughly 7.5 km long in the City of Guelph, Ontario. It includes the area surrounding the existing York Trunk Sewer Main which runs from Victoria Road along the Eramosa and Speed Rivers to the wastewater treatment plant located on Wellington Street. The approximate limits of the Study Area are presented on Figure 2. The corridor passes through and adjacent to residential areas, highways, undeveloped lands and waterways (see Figures 1-3 and Appendix).

The study area's dimensions fall both within and outside of the historic limits of the City of Guelph (see Section 5.3.3).

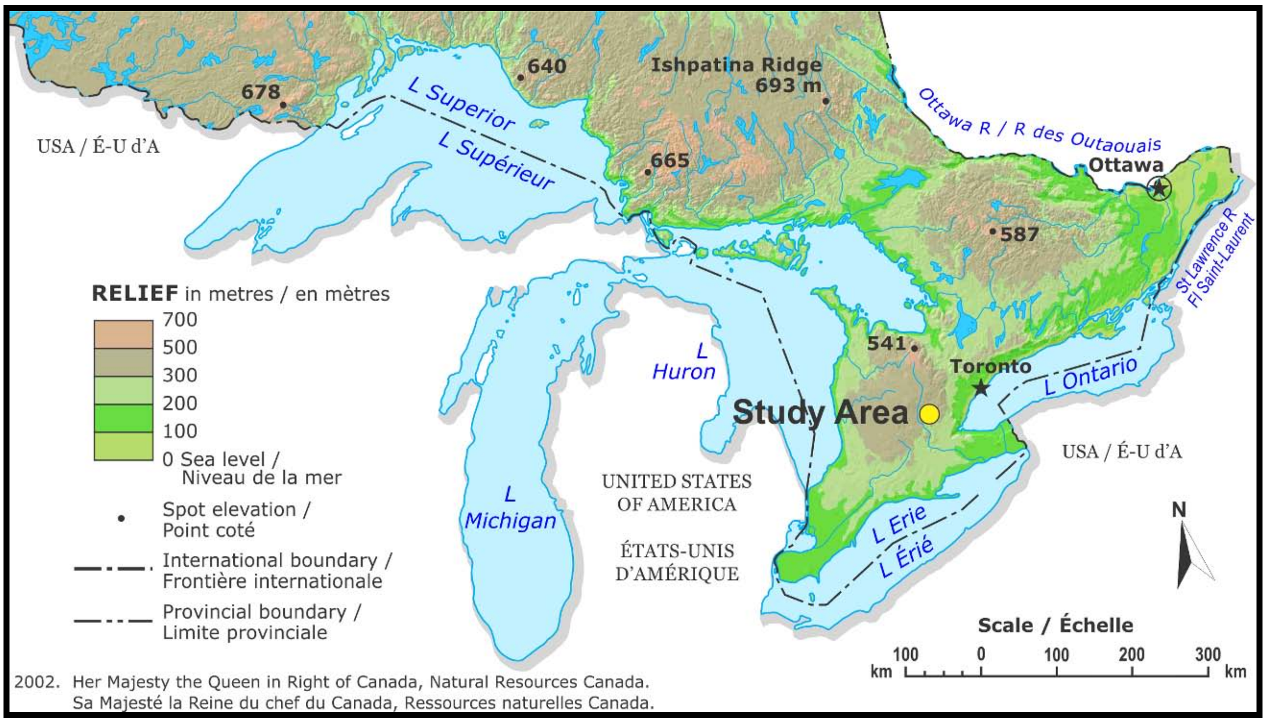

Figure 1: Location of Study Area in the Province of Ontario

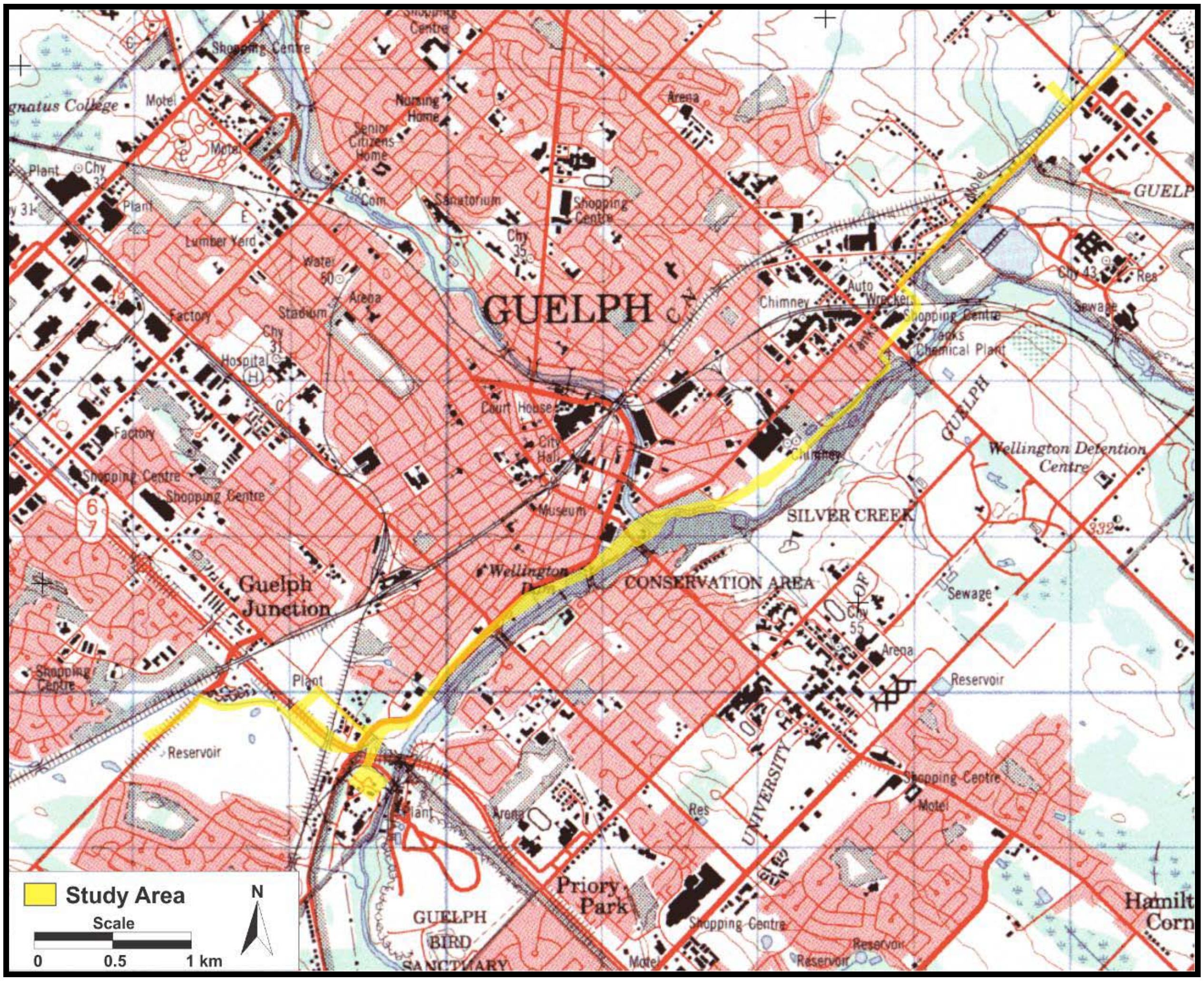

Figure 2: Study Area in the City of Guelph

3.0 Geography

It has long been understood that environment plays a key role in determining site location, particularly in small societies with non-complex, subsistence-oriented economies. The local environment of the study area lies within the Great Lakes-St. Lawrence Forest, which is a transitional zone between the southern Deciduous Forest and the northern Boreal Forest. Vegetation here consists of a mixture of coniferous trees and deciduous trees, as well as many species of ferns, fungi, shrubs and mosses. The most prominent conifers are eastern white pine, red pine, eastern hemlock and white cedar, while deciduous trees are best represented by yellow birch, sugar and red maple, basswood and red oak. Other species more commonly occurring in the north are also present, including white and black spruce, jack pine, aspen and white birch (Ontario Ministry of Natural Resources 2009).

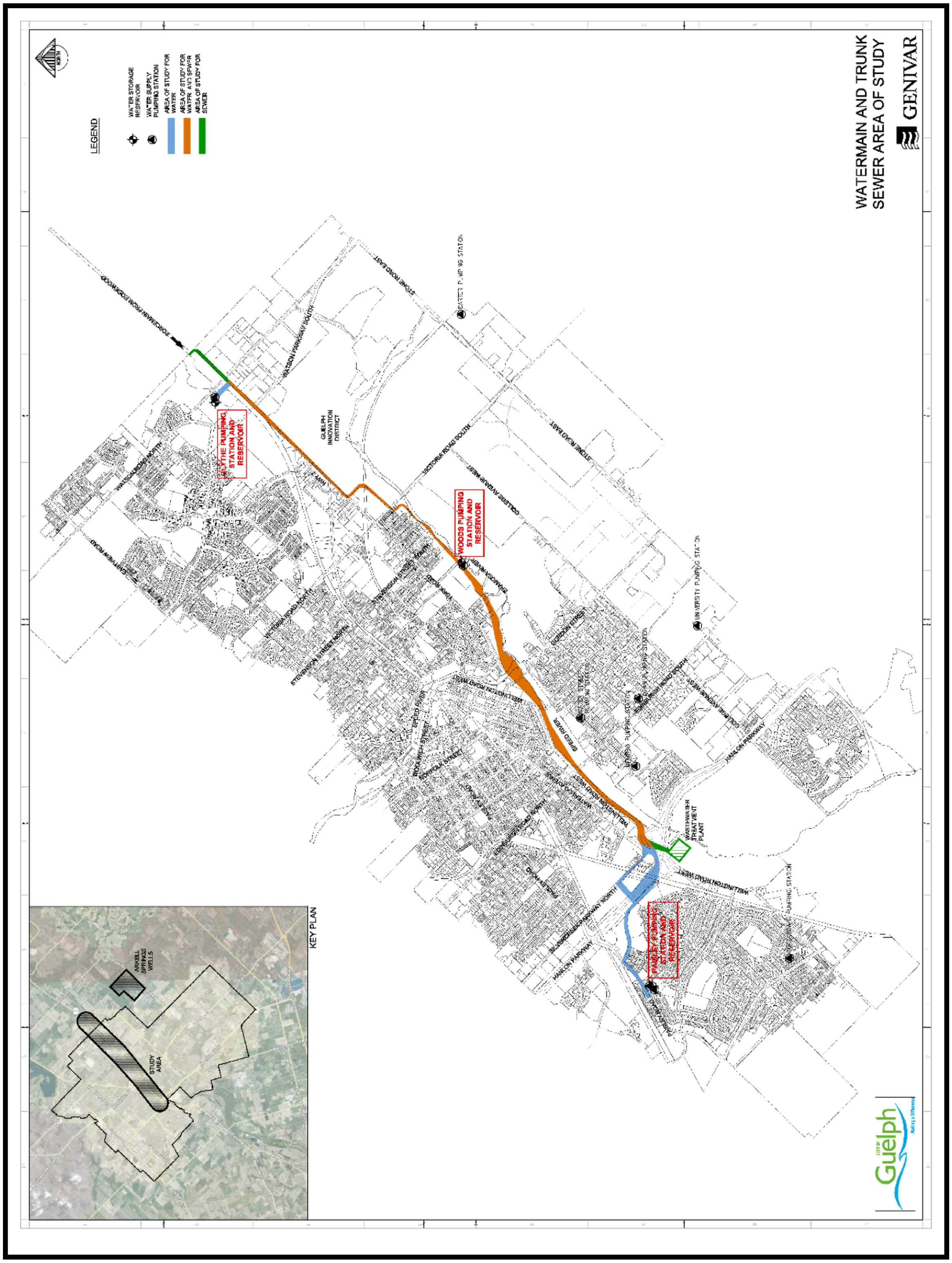

Figure 3: Key Plan of the Study Area, Provided by GENIVAR

In the Great Lakes region it is believed that the First Nations used some 500 plant species as food, food flavourings, drinks, medicines, building materials, fibres, dyes, and basketry (Mason 1981:59). As such, it is clear that vegetation played an important role in the site selection processes employed by Pre-Contact Aboriginal groups. Furthermore, this vegetation served as home and food for a wide range of game animals such as white tailed deer, turkey, passenger pigeon, cottontail rabbit, elk, muskrat, and beaver (Mason 1981:60).

The local climatic region is characterized by cold winters and warm summers, with average temperatures ranging from -6.1 to -7.2 ºC and 18.3 to 18.8 ºC, respectively. The vicinity of the study area experiences a growing season that typically lasts between 189 and 196 days, with approximately 147 frost-free days per year. The mean annual precipitation level is 743 mm, with snowfalls reaching upwards of 1295 mm in southern Wellington County (Hoffman et al. 1963:15).

Physiographically, the study area lies in the region known as the Guelph Drumlin Field, which lies northwest of the Paris Moraine and includes roughly 300 broad oval drumlins of various sizes. The drumlins themselves consist largely of loamy and calcareous till, and analyses have placed the average grain sizes in the neighbourhood of 50% sand, 35% silt and 15% clay. These drumlins are not closely grouped, and the intervening low ground supports mainly fluvial materials created by river action (Chapman and Putnam 1984:137-138). Soils in the vicinity of the study area consist primarily of Burford Loam, which is a Grey-Brown Podzolic made up of gravel with good drainage qualities. In the eastern end, however, areas of Caledon Fine Sandy Loam (fine sand over gravel) and Guelph Loam (loam till) are also present (Hoffman et al. 1963:Soil Map South Sheet). This area falls within the Great Lakes Lowlands geological zone in a place where the bedrock is part of the Middle and Lower Silurian Guelph Formation, consisting primarily of dolostone (Davidson 1989:37, 42).

4.0 Previous Archaeological Research

An archival search was conducted using the Ontario Ministry of Tourism and Culture Archaeological Sites Database in order to determine the presence of any registered heritage resources which might be located on or within a 2 km radius of the study area. It was found that 15 registered sites lay within these limits (see Table 1). None of these documented sites are located within the study area, but AjHb-72 is immediately adjacent to project lands in the east along Highway 7.

Table 1: Registered Archaeological Sites within 2 km of the Study Area

Borden No.	Site Name	Cultural Affiliation	Site Type/Feature
AjHb-071	Baker Street	Euro-Canadian	Cemetery
AjHb-27	Turf Grass Institute	Early/Middle/Late Archaic	Campsite
AjHb-72	Murphy	Euro-Canadian	Homestead
AjHb-76	Martin	Euro-Canadian	Homestead

AjHb-42	Mitchell Farm Site #1	Middle Archaic	Hunting Camp
AjHb-43	Mitchell Farm Site #6	Euro-Canadian	Homestead
AjHb-45	IF #9 (Mitchell Farm)	Late Archaic	Findspot
AjHb-46	IF #10 (Mitchell Farm)	Middle Archaic	Findspot
AjHb-49	Fabio	Middle Archaic	Findspot
AjHb-50	Simon-Wood	Late Archaic	Findspot
AjHb-51	Carter	Euro-Canadian	Homestead
AjHb-52	N/A	Pre-Contact	Findspot
AjHb-53	N/A	Late Archaic	Findspot
AjHb-54	N/A	Euro-Canadian	Homestead
AjHb-55	Creighton	Pre-Contact/Euro-Canadian	Findspot/Homestead

5.0 Historic Land Use Summary

5.1 The Pre-Contact Era

The first settlers in southern Ontario were the Palaeo-Indian people who arrived after the retreat of the Wisconsinan glaciers, approximately 9000 BC. For approximately 1,500 years the Palaeo-Indians lived as hunter-gatherers in the area's boreal-like landscapes, ranging over very wide territories in order to live sustainably in an environment with low biotic productivity (Ellis and Deller 1990:52-54). Traditionally, Palaeo-Indians have been conceptualized as 'big game hunters' who lived on caribou and other Pleistocene megafauna. However, given the poor preservation of these sites (which are mostly understood only from stone tool and debris from their manufacture), much about the lifeways of these people remains unknown (Ellis and Deller 1990:38). In general, the impacts that humans left on their environment at these times were small (less than 200 sq. m) and ephemeral (Ellis and Deller 1990:51).

Beginning around 8000 B.C. the biotic productivity of the environment began to increase as the climate warmed and the watershed was colonized by deciduous forest. As a result, more opportunities arose for the exploitation of both animal and plant food sources. The resulting broad-based economy was the basis for the archaeological cultures that are referred to as 'Archaic'. During this period (ca. 8000 to 800 B.C.) there was an explosion in the number and variety of raw materials, tool forms, site types, and the number of sites themselves. Because Archaic sites are more recent than Palaeo-Indian ones, preservation tends to be better. Artifacts composed of bone, shell, and even wood are not unheard of. During the Late Archaic period, heavy wood-working tools appear, suggesting that people were building shelters or other objects, such as transportation aids (Ellis et al. 1990:66-67).

It is clear from the toolkits that have been unearthed that Archaic peoples had an encyclopaedic understanding of the environment that they inhabited. The number and density of the sites that have been found suggest that the environment was exploited in a successful and sustainable way over a considerable period of time. The success of Archaic lifeways is attested to by clear evidence of steady population increases over time. Eventually, these increases set the stage for the final period of Pre-Contact occupation – the Woodland Period (Ellis et al. 1990:120).

The Woodland Period began around 800 BC and is characterized by the appearance of pottery. It is believed that hunting and gathering remained the primary subsistence strategy throughout the Early Woodland Period (800 to 300 B.C.) and well into the Middle Woodland Period (300 B.C. to A.D. 700) (Spence et al. 1990:128, 168). The Saugeen complex is perhaps the best attested in the vicinity of the study area, and numerous sites have been identified in southern Ontario between Lake Huron, Lake Erie and Lake Ontario (see Figure 4). This complex is characterized by shell-stamped ceramics, a wide variety of chipped stone tools and a lifeway geared towards the exploitation of seasonally-available resources such as game, nuts and fish (Finlayson 1977; Spence et al. 1990:147-156).

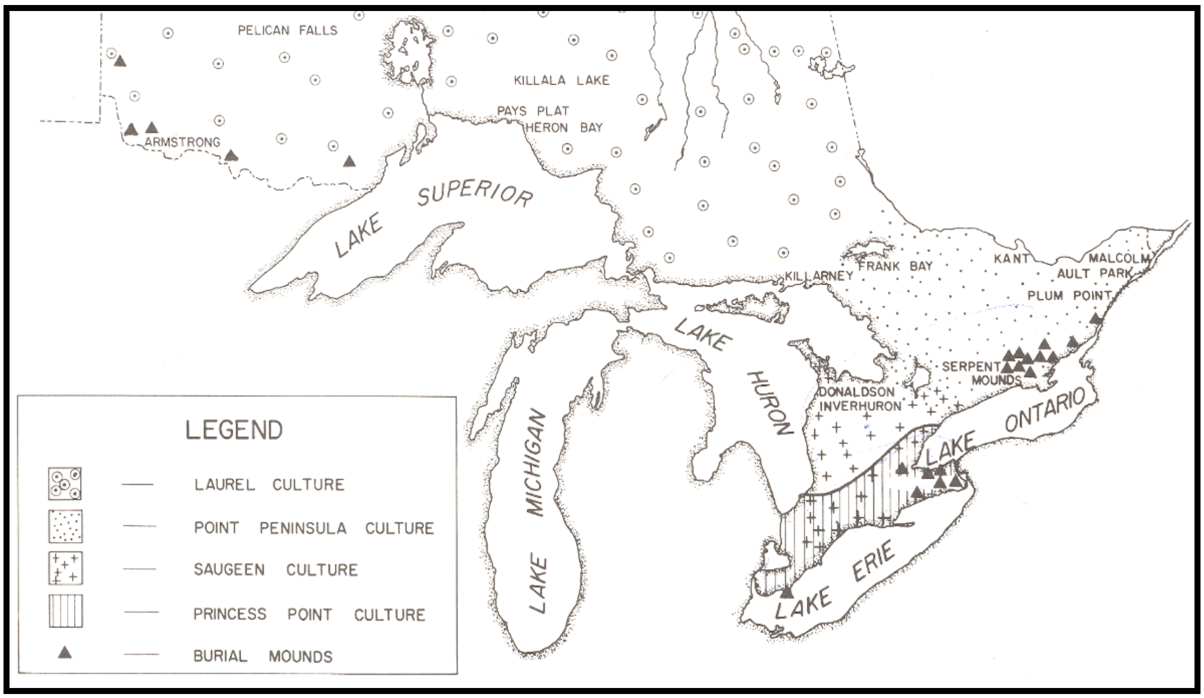

Figure 4: Map of Middle Woodland Period Complexes
(Wright 1972:Map 4)

During the Middle to Late Woodland transition the first rudimentary evidence of maize (corn) horticulture appears in southern Ontario, and settled agriculturalists emerge in some areas (Fox 1990:171, Figure 6.1). The Grand Banks site, near Cayuga, Ontario (ca. A.D. 400 to 600), has yielded the earliest evidence of maize horticulture in northeastern North America. This site is well known for providing the earliest archaeological manifestations of the Princess Point culture (ca. A.D. 500 to 1000), whose distinctive artifacts and reliance on corn as a staple suggests that they are directly ancestral to the later Iroquoian-speaking peoples of southern Ontario (Warrick 2000:427).

Many Princess Points sites appear to represent semi-permanent settlements that may have been returned to again and again over successive centuries. The remains of the Grand Banks site, for instance, extend for one kilometre along the bank of the Grand River. At other sites artifact recovery rates of over a thousand per sq. m are not unheard of. Intriguingly, approximately half of the documented Princess Point sites in Ontario have been discovered along the Grand River (see Figure 5).

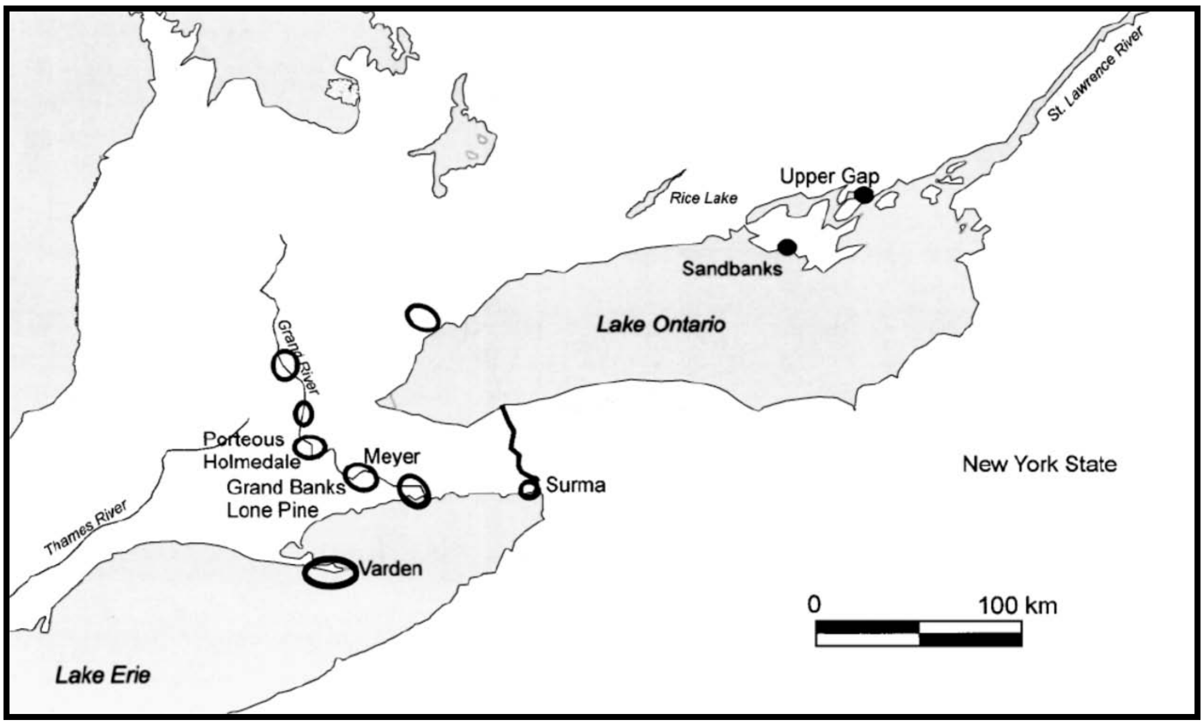

Figure 5: Princess Point Site Clusters in Southern Ontario
(Warrick 2000:Fig. 3)

During the Late Woodland Period (ca. A.D. 700 to 1650) maize horticulture spread beyond the confines of the Grand and Credit Rivers, allowing for population increases which in turn led to larger settlement sizes, higher population density, and increased social complexity among the peoples involved. Between A.D. 1000 and 1300 'Early' Iroquoians began living in small villages (0.4 ha) comprised of four or five longhouses, producing pottery with decorated incised rims, and using pipes to smoke tobacco (Warrick 2000:434-438). From A.D. 1300 to 1400 'Middle' Iroquoian culture became even more developed, and two 50 year sub-stages (the Uren and Middleport) have been identified and studied in detail (Dodd et al. 1990:356-359; Warrick 2000:439-446). Essentially, the lifeways that were observed by the first Europeans to venture into the area were in place by this time.

By A.D. 1450, near the beginning of the 'Late' Iroquoian period (A.D. 1400 to 1650), it is possible to differentiate between the archaeologically-represented groups that would become the Huron and the Neutral of the Early Contact period (see Figure 6). The study area falls within the territory of the Neutral Nation, whose material culture included ceramic vessels and pipes, lithic chipped stone tools, ground stone tools, worked bone, antler and teeth, and exotic goods obtained through trade with other Aboriginal and European groups (Lennox and Fitzgerald 1990:411-437). The Neutral lived in large villages, which sometimes swelled to as much as 5 ha in size and had longhouses reaching over 100 m in length. It is believed that some villages may have held as many as 2,500 inhabitants (Warrick 2000:446-454). In total, the Neutral are believed to have numbered upwards of 40,000, with the total population distributed between 28 to 40 villages and smaller settlements (Lennox and Fitzgerald 1990:410).

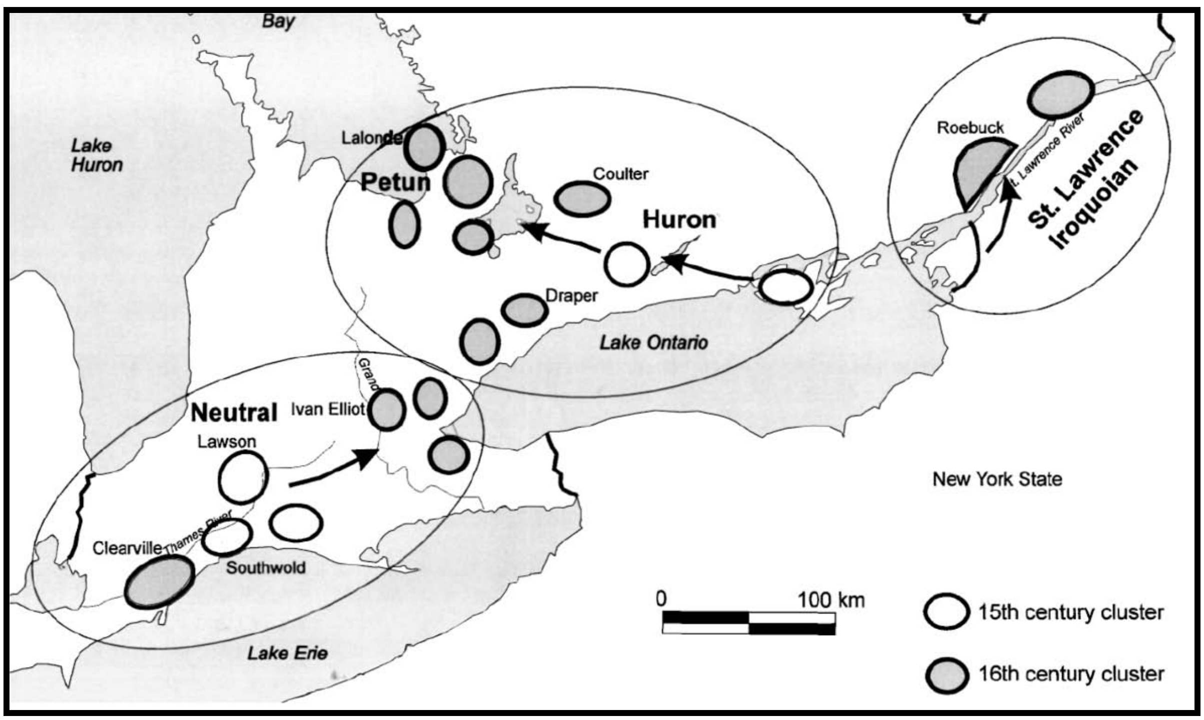

Figure 6: Pre-Contact Iroquoian Site Clusters
(Warrick 2000:Fig. 10)

It has been suggested that the size of these villages, along with the necessary croplands to sustain them, may have had some enduring impacts on the landscapes that surrounded them. In particular, there has been a correlation postulated between Pre-Contact era corn fields and modern stands of white pine (Janusas 1987:69-70, Figure 7). While the studies involved have been far from comprehensive, the notion that depleted corn fields may have taken some time to recover their fertility, and that the natural succession of plants growing on them would be affected, seems logical.

5.2 The Early Contact Period

The first European to venture into what would become Ontario was Etienne Brulé, who was sent by Samuel de Champlain to visit the area and learn the language and customs of the First Nations there. Champlain himself made two trips to Ontario, first in 1613 and later from 1615 to 1616 (Gervais 2004:182). The First Nations encountered by Champlain in this part of southern Ontario included the Huron (Wendat), the Petun (Tobacco) and "la nation neutre" (the Neutrals). The first two groups were concentrated in what would become the Counties of Simcoe and York and in the Grey-Bruce region, respectively. The Neutrals, on the other hand, occupied the territory immediately west of Lake Ontario and along the northern shore of Lake Erie, and Neutral sites have been identified throughout the Niagara Peninsula and as far west as Chatham. The study area falls within the territory of this last group (Lennox and Fitzgerald 1990:Figure 13.1).

Jean Boisseau's *Description de la Nouvelle France* (1643) shows the territory of the Neutral Nation, although the orientation and distribution of the Great Lakes is clearly an abstraction (see Figure 7). Nicholas Sanson's *Le Canada, ou Nouvelle France* (1656) is much more representative, and the Neutral can be seen in lands west of Lake Ontario (see Figure 8).

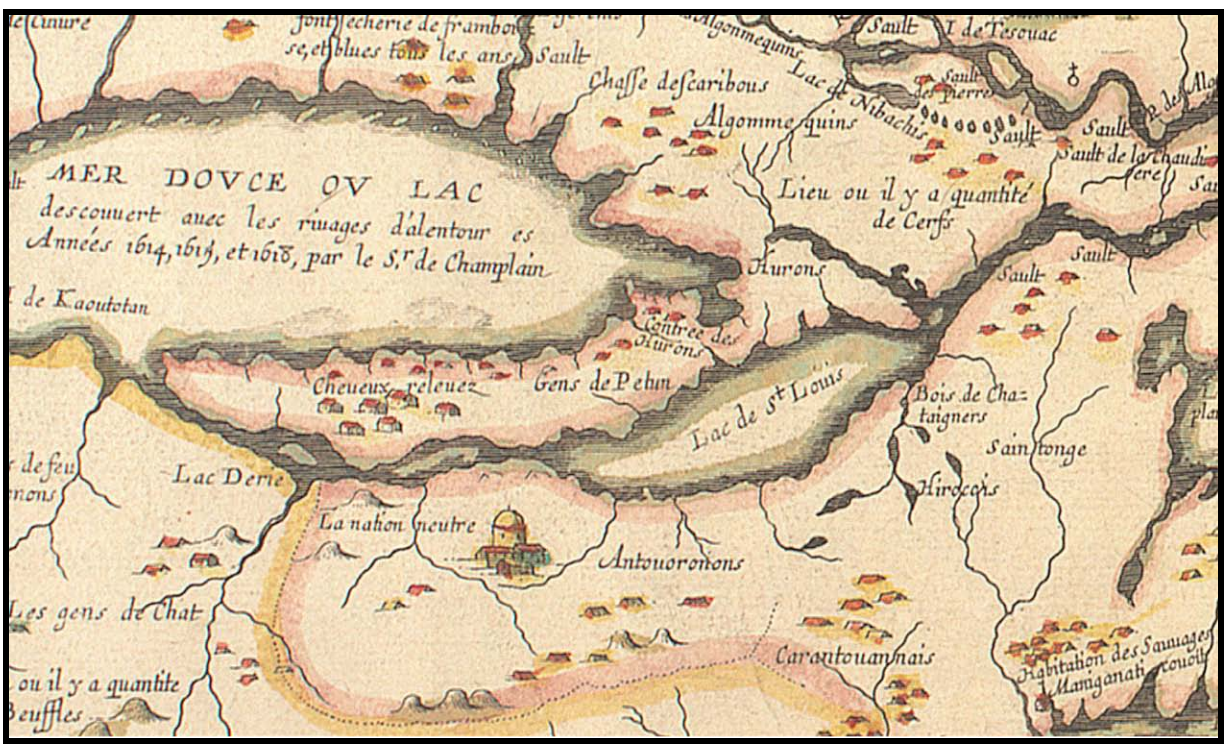

Figure 7: Detail of Jean Boisseau's *Description de la Nouvelle France* (1643)
(McGill University 2005:W. H. Pugsley Collection)

Figure 8: Detail of Nicholas Sanson's *Le Canada, ou Nouvelle France* (1656)
(McGill University 2005:W. H. Pugsley Collection)

The first half of the 17th century saw a marked increase in trading contacts between the First Nations and European colonists. These trading contacts, however, eventually led to increasing factionalism and tension between the First Nations as different groups vied for control of the lucrative fur trade. In what would become Ontario, the Huron, the Petun, and their Anishinabeg trading partners allied themselves with the French. In what would become New York State, the League of the Haudenosaunee (Iroquois Confederacy) allied themselves with the British. At that time the Iroquois Confederacy consisted of the independent nations of the Mohawk, Cayuga, Onondaga, Oneida and Seneca, which were later joined by the Tuscarora in 1722 to form the Six Nations. Interposed between the belligerents, the Neutral Nation declined to align itself with either group.

Tensions boiled over in 1649, a situation likely exacerbated by epidemics brought by the Europeans and the associated decimation of the Aboriginal populations, and the Five Nations invaded southern Ontario. The Iroquois directed their assaults against the Neutrals in 1650 and 1651, taking multiple frontier villages (one with over 1,600 men) and numerous captives (Coyne

1895:18). The advance of the Iroquois led to demise of the Neutral Nation as a distinct cultural entity and the dispersal of the Wendat and Petun nations (Lennox and Fitzgerald 1990:456, Ramsden 1990:384). The remnants of the affected nations formed new communities, settling in Quebec (the modern-day community of Wendake), near lake St. Claire (where they were known as the Wyandot), and in the area of Michilimackinac. Many were probably adopted into the League of the Haudenosaunee (Ramsden 1990:384).

After the fall of the Neutrals and the dispersal of the Wendat, southern Ontario remained an underpopulated wilderness for several generations (see Figure 9), sitting "cold and empty and windswept" (Ramsdem 1990:384). It has been described as an "unbroken forest", teeming with wildlife and exploited by the Iroquois as a rich hunting ground (Coyne 1895:20).

Figure 9: Detail of Henry Poppel's *A Map of the British Empire in America* (1733)
(Cartography Associates 2009:David Rumsey Collection)

For the next 40 years the Haudenosaunee/Five Nations exploited southern Ontario for its furs and traded them with the Dutch and the English, and also traded for furs with the northern Algonkian-speaking peoples (Smith 1987:19). In 1669, the Haudenosaunee allowed an expedition of Sulpician missionaries to travel through their territory. This expedition, which included Francoi Dollier de Casson and René de Brehant de Galinée, managed to reach and explore the Grand River, which they named *le Rapide* after the swiftness of its current. The priests descended the Grand to reach Lake Erie, and they wintered at the future site of Port Dover (Coyne 1895:21). Their map is one of the earliest documented representations of the Grand River (see Figure 10).

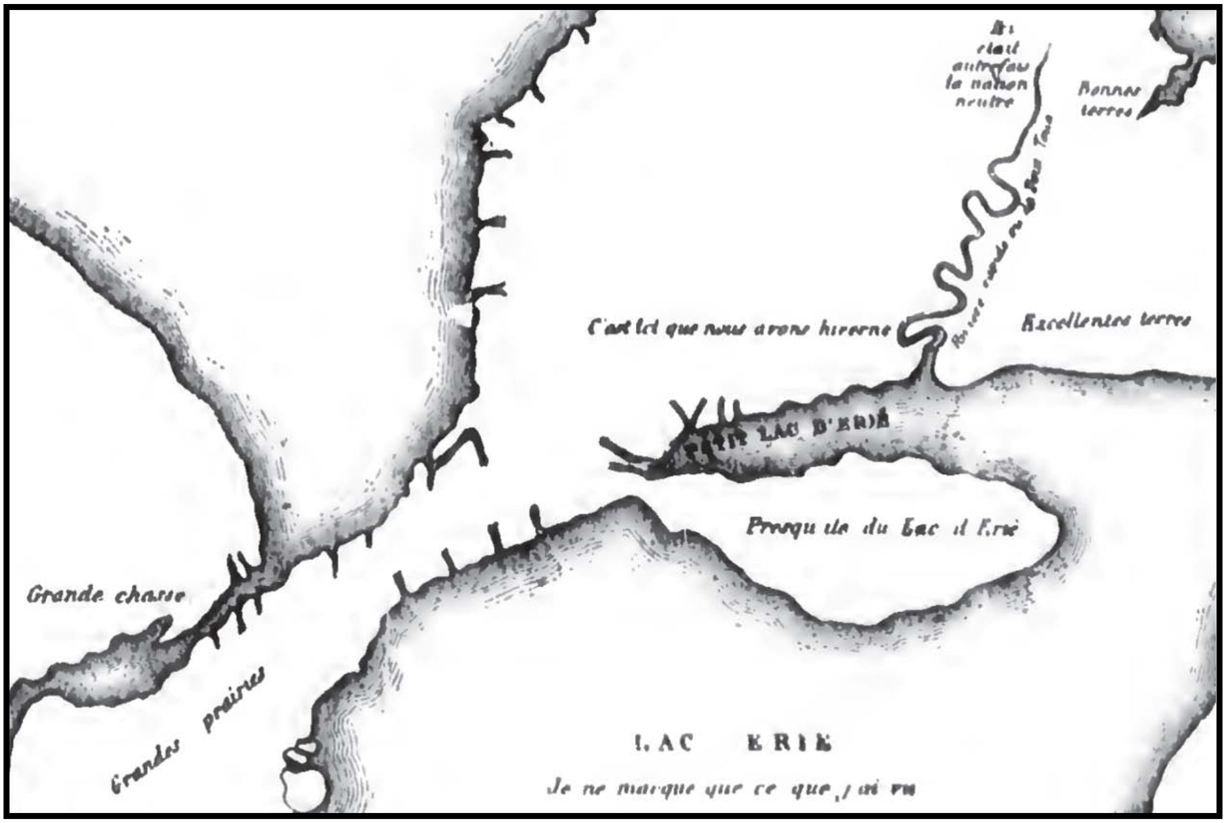

Figure 10: Detail from Dollier de Casson and de Galinée's *Carte du Canada et des Terres découuertes vers le lac Derié (*1670*)*, Showing the Grand River
(Coyne 1895:Map)

Five Nations' fortunes changed by the mid-1690s, and disease and casualties from battles with the French had taken their toll on the formerly robust group (Smith 1987:19). On July 19, 1701, the Iroquois ceded lands in southern Ontario to King William III, with the provision that they could still hunt freely in the territory, but this agreement appears to have lacked any binding formality (Coyne 1895:28; Six Nations Council 2010:1).

In truth, it is difficult to evaluate the level of control the Iroquois exercised over the area at this time. The northern traditions of the Algonkian-speaking Anishinabeg maintain that Ojibway bands expanded into these Iroquoian-held lands in an effort to trade directly with the French and the English (Smith 1987:19). This competition exacerbated tensions between the Haudenosaunee and the Ojibway, and the Ojibway are traditionally held to have defeated the Iroquois in a series of battles, culminating in complete victory near Burlington Bay. By the early 18th century Haudenosaunee settlements appear to have contracted back into New York State. Peace was then established between the Anishinabeg and the Iroquois (Coyne 1895:28).

Bands of Anishinabeg subsequently moved into southern Ontario, many of which were mistakenly lumped together by the Europeans under the generalized designations of ‘Chippewa/Ojibway’ and ‘Mississauga’. The ‘Mississaugas’, first documented in 1640 as an Aboriginal band on the northwestern shore of Lake Huron (Smith 1987:19), became a term applied to all Algonkian-speaking people around Lake Ontario (see Figure 11). Throughout the 1700s (and into the early 1800s), these ‘Mississaugas’ hunted, fished, gardened and camped along the rivers, floodplains and forests of southern Ontario (Warrick 2005:2). The footprint left by these people on the landscape they inhabited was exceedingly light, and archaeological sites dating to this time of early European contact are both rare and difficult to detect.

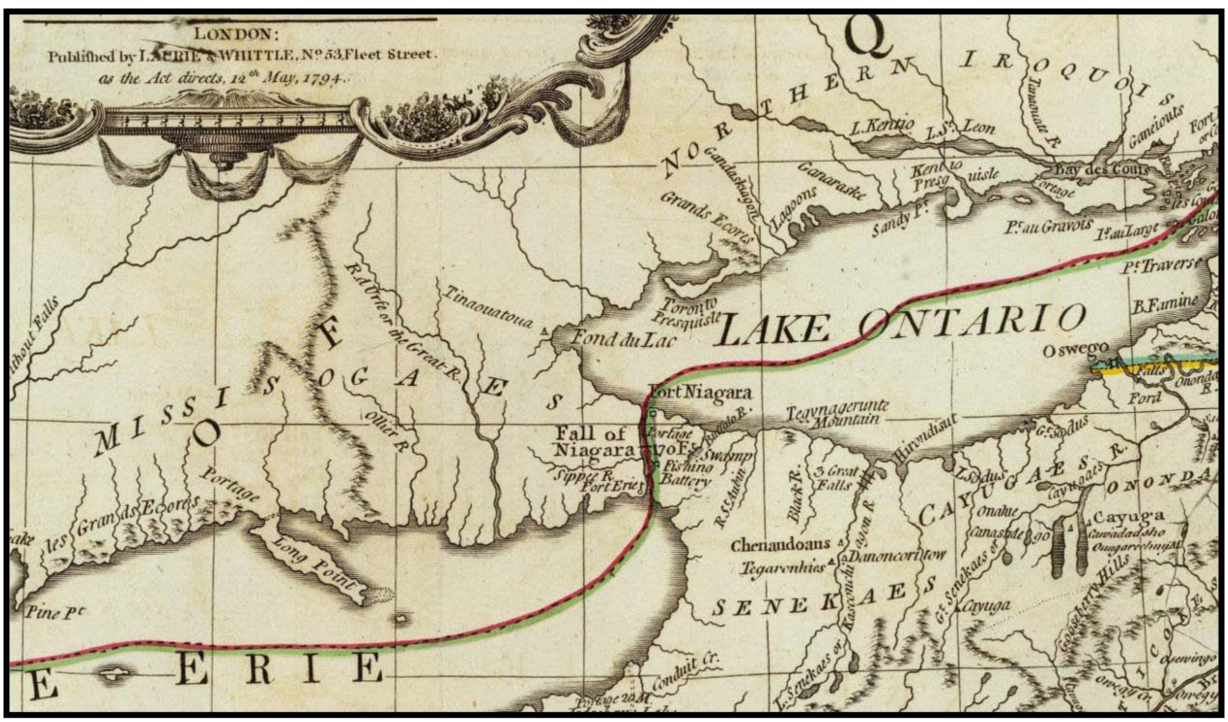

Figure 11: Detail of Laurie and Whittle's *A New and General Map of the Middle Dominions Belonging to the United States of America* (1794)
(Cartography Associates 2009:David Rumsey Collection)

The 18th century saw the continued competition between the French and the English over the fur trade, which the Anishinabeg took full advantage of and were consequently well supplied with European trade goods. The Mississaugas in particular are known to have traded furs with the French at numerous locations, and received "everything from buttons, shirts, ribbons to combs, knives, looking glasses, and axes" (Smith 1987:22). The British, on the other hand, were well-rooted in New York State and tended to enjoy more success and prosperity than their counterparts.

In 1754, hostilities over trade and territorial ambitions led to the Seven Years' War (often called the French and Indian War in North America), in which the Mississaugas fought on behalf of the French. After the French surrender in 1760 they adapted their trading relationships accordingly, and formed a new alliance with the British (Smith 1987:22). However, with the American Revolutionary War (1775-1783) and the resultant flood of United Empire Loyalists into the Province of Quebec (which included what would become Ontario), conditions became less advantageous. Population growth caused many to move into European territory, but the death of the fur trade left the Anishinabeg with little to exchange for European goods aside from their land.

5.3 The Euro-Canadian Era

During the American Revolutionary War (1775-1783), most of the League of the Haudenosaunee/Six Nations (except for the Oneida) supported the Loyalist/British cause. This was unsurprising given their longstanding history of allegiance and cooperation. In 1779, two years after joining the conflict, most Seneca, Onondaga and Cayuga towns became targets of American forces and were destroyed. This caused the Iroquois to seek retribution, and under the leadership of the Mohawk captain Joseph Brant, Iroquois forces attacked and burned rebel forts and settlements as far east as Schenectady, New York (Ramsden 2010).

The war ended in 1783, and Great Britain and the newly incorporated United States established their formal boundaries in a process which involved numerous treaties that lacked Aboriginal input and involvement. The governor of what was then the Province of Quebec, Lord Frederick Haldimand, arranged to purchase a tract of land from the Mississaugas in 1784, which he intended for the resettlement of Six Nations loyalists displaced by the war (Coyne 1895:29; Six Nations Council 2010:2). Approximately 950,000 acres were included in the so-called Haldimand Tract, which extended 9.6 km (6 miles) to either side of the Grand River, from its source to its mouth (see Figure 12).

In what would become the first of a number of legal complications to the transfer, Haldimand left office before the grant was legally confirmed and before title for the lands was properly transferred to Brant and his people. As settlers began to move into Six Nations territory, the land quickly became unsuitable for hunting and Brant's people needed to find alternate means of support. In 1787, Brant began to sell some lands within the tract to raise investment income for Six Nations (Johnston 1964:xliii).

Figure 12: The Haldimand Tract (Left) and the Haldimand Proclamation (Right)
(Six Nations Council 2010:2)

Four years later, the face of what would become Ontario changed considerably, as the Constitutional Act of 1791 created the Provinces of Upper Canada and Lower Canada from the former Province of Quebec (Craig 1963:17). Colonel John Graves Simcoe was appointed the first Lieutenant Governor of Upper Canada, and he was responsible for governing the new province, directing its settlement and establishing a constitutional government modelled after that of Britain (Coyne 1895:33). In 1792, Upper Canadian legislature incorporated the Eastern, Midland, Home and Western Districts from the former Lunenburg, Mecklenburg, Nassau and Hesse Districts of the Province of Quebec (previously established by Lord Dorchester in 1788).

Simcoe initiated several schemes to populate and protect the newly-created province, and he employed a settlement strategy that relied on the creation of shoreline communities with effective transportation links. These communities, inevitably, would be comprised of lands obtained from the First Nations, and many surrenders and purchases were arranged in the closing years of the 18th century and in the early 19th century.

In 1793, Simcoe issued a patent confirming Six Nations' title to the Haldimand Tract, but at the same time he reduced the size of the grant by 275,000 acres (the ‘Source Lands’ of the Grand River), arguing that the Crown could not grant lands that they did not own (Historical Atlas Publishing Co. 1906:2). Simcoe further specified that Tract land could only be sold to the Crown, as he was concerned that ‘land jobbers’ (speculators) might take advantage of the Six Nations.

Brant was in favour of the sales, and in 1796 he was granted Power of Attorney to surrender “In Trust” four large sections of the Haldimand Tract (Blocks 1-4) in exchange for yearly payments for the “perpetual care and maintenance” of Six Nations for 999 years (Six Nations Council 2010:3). In 1797, the Executive Council of Upper Canada appointed three trustees to act on behalf of Six Nations in negotiating the sale (Johnston 1964:xlvi-xlvii). In 1798, Brant surrendered Blocks 1-6 (352,707 acres) “In Trust” to the Crown, exceeding his Power of Attorney (Six Nations Council 2010:Insert 1).

Many of these lands would eventually be incorporated into Wellington County. The ‘Source Lands’, originally proclaimed by Haldimand but never transferred (Six Nations Council 2010:2), would eventually become part of the Townships of East and West Luther, Amaranth, East and West Garafraxa, Erin and Eramosa (Six Nations Council 2010:Insert 4-5). The lands of these future townships, as well as Luther and part of Arthur, were officially obtained by the Crown from the Mississaugas in 1818 as part of a purchase involving a total of 648,000 acres (Historical Atlas Publishing Co. 1906:2). Part of Haldimand Tract Block 3 would become Pilkington Township, and Block 4 would later be known as Nichol Township. The remaining lands that came to make up Wellington County, including the future townships of Peel, Maryborough, Minto and the remainder of Arthur, were surrendered in 1827 by chiefs of the Chippewa Nation (Historical Atlas Publishing Co. 1906:2).

William David Smyth’s *Map of the Province of Upper Canada* from 1800 illustrates the complex arrangements of lands that would become Wellington County (see Figure 13). The Six Nations’ Lands of the Haldimand Track are clearly visible, of which part of Block 3 and all of Block 4 would eventually be incorporated. To the north are the ‘Source Lands’ that were never transferred to Brant, and instead were obtained from the Mississaugas by the Crown in 1818. To the northwest are Reserved Lands of the Chippewa Nation, which they surrendered in 1827. To the east are Church Lands, which were part of the 1/7th of all Crown lands designated for the clergy under the Constitutional Act of 1791. These lands were originally intended to be spread evenly throughout Upper Canada, but instead they were typically reserved in large blocks adjacent to the nearest established townships. Eventually a clergy corporation was created to make leases, but few settlers were interested in these relatively expensive lands. After some 60 years of issues and agitation by both clergy and colonists, the clergy reserves were abolished in 1854 (Historical Atlas Publishing Co. 1906:2).

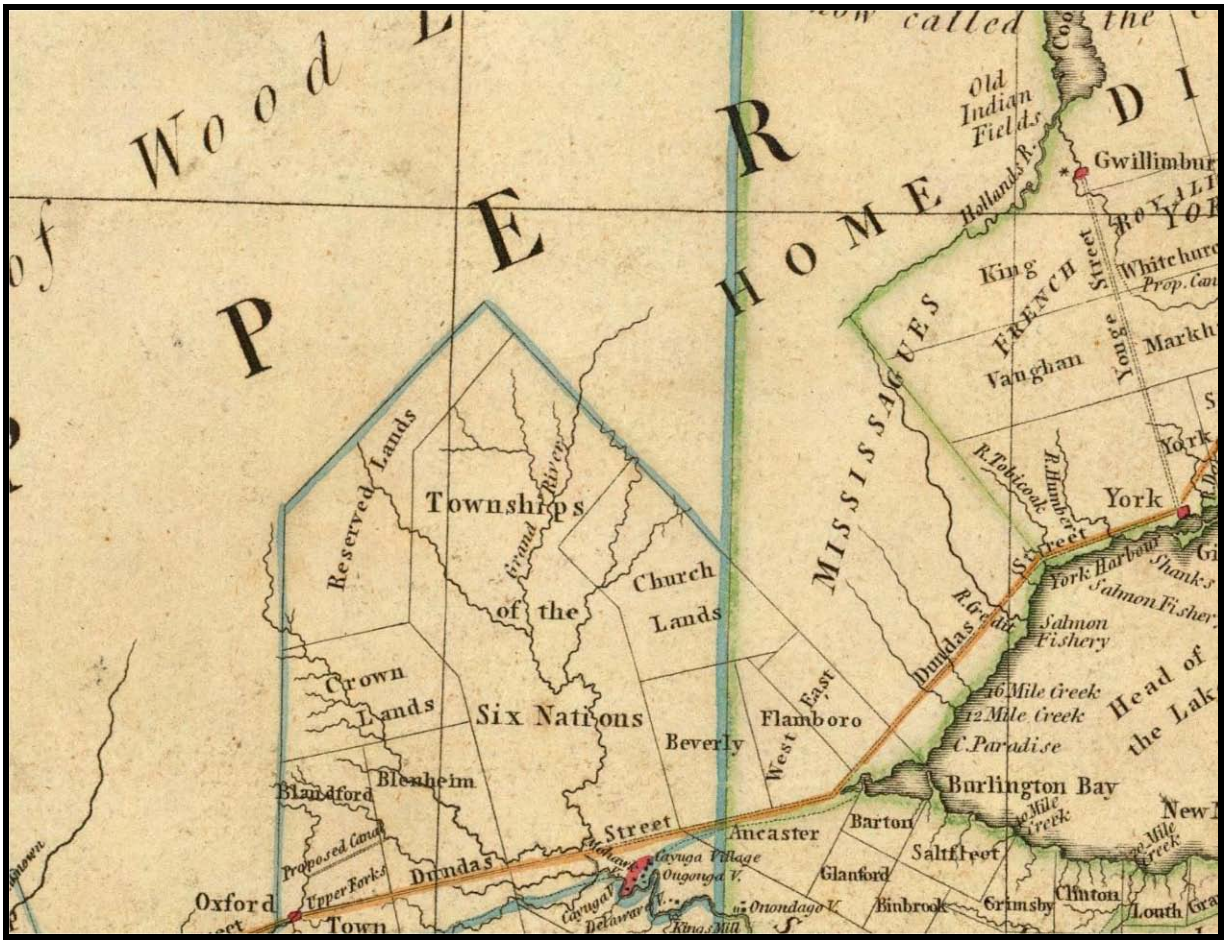

Figure 13: Detail of Smyth's *A Map of the Province of Upper Canada* (1800)
(Cartography Associates 2009:David Rumsey Collection)

5.3.1 The County of Wellington

The large expanse of lands that would become the historic County of Wellington was obtained partly from the Six Nations and partly from other treaties and surrenders with Anishinabeg peoples surrounding the Haldimand Tract. The area fell within several different political boundaries between the late 18th and 20th centuries, and the administrative history of the land is one of the most complex and rich in southern Ontario. By the second session of the second Parliament of Upper Canada in 1798, the Home and Western Districts were subdivided, and the Niagara and London Districts were created from each, respectively. What would become Wellington County remained, at that time, within the Home District, and the majority was initially administered as part of the West Riding of the expansive County of York (see Figure 14). The future townships in the northeastern part, however, fell within the boundaries of Simcoe County, while those in the northwest actually belonged to the sparsely settled London District.

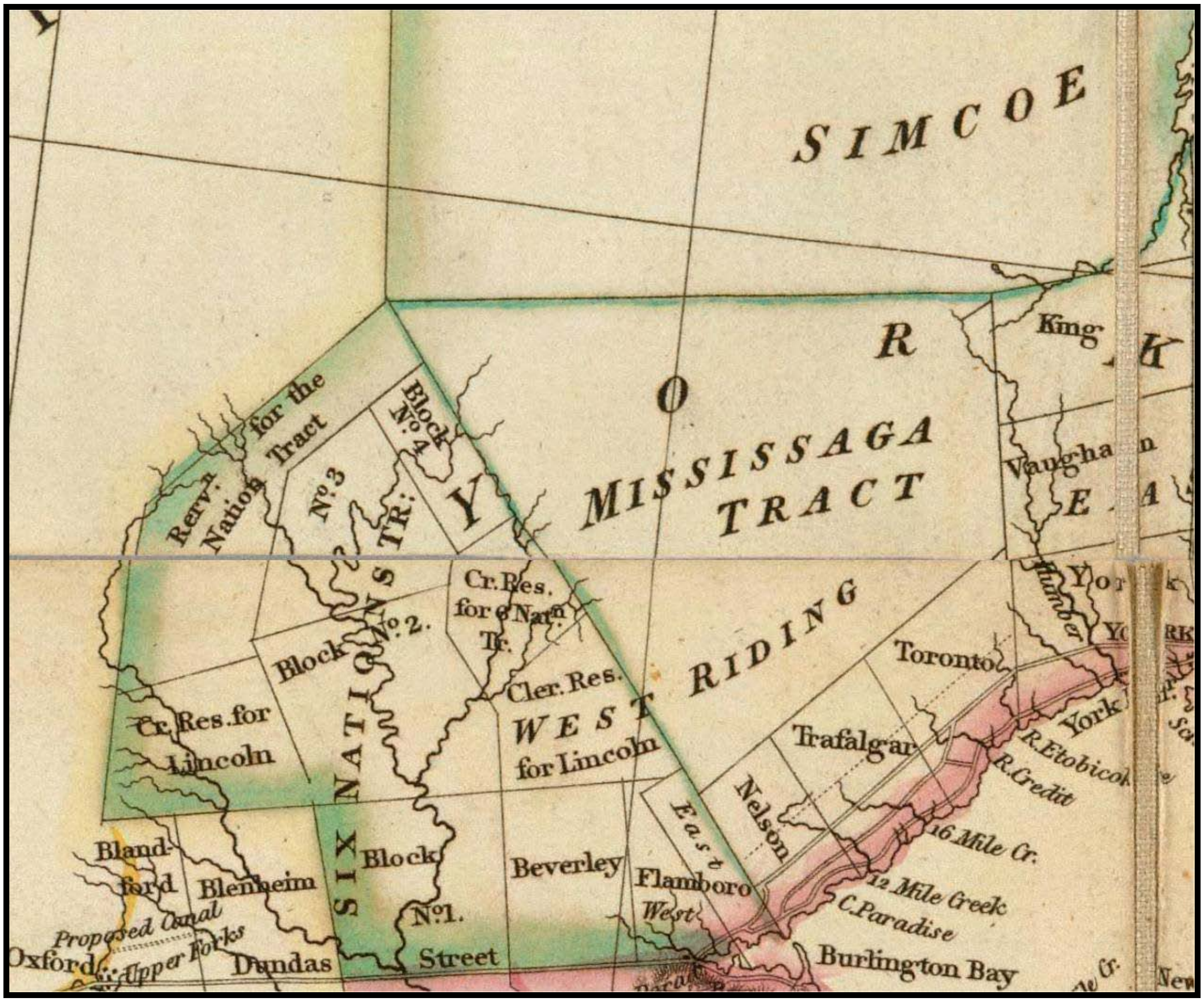

Figure 14: Detail from J. Purdy's *A Map of Cabotia* (1814)
(Cartography Associates 2009:David Rumsey Collection)

At the turn of the 19th century, these Crown lands were freely granted to arriving settlers, provided that they met specific conditions of settlement. These pioneers were required to clear at least 5 acres of their lot and the adjacent road allowance, as well as build and shingle a house within 18 months. Once these requirements were met, the Crown Deed was issued (Historical Atlas Publishing Co. 1906:2).

Eventually, as smaller units of government became more desirable, York County and the Home District were further divided. Much of what would become Wellington County was incorporated into the newly formed Halton County in the Gore District in 1816. Its seat was located in Hamilton (Historical Atlas Publishing Co. 1906:2). At that time the northernmost future Townships of Luther and Amaranth remained part of Simcoe County in the Home District, while those of Minto, Arthur and Maryborough continued to be part of the London District (see Figure 15). The southern townships of the Gore District were the best settled (Smith 1846:213).

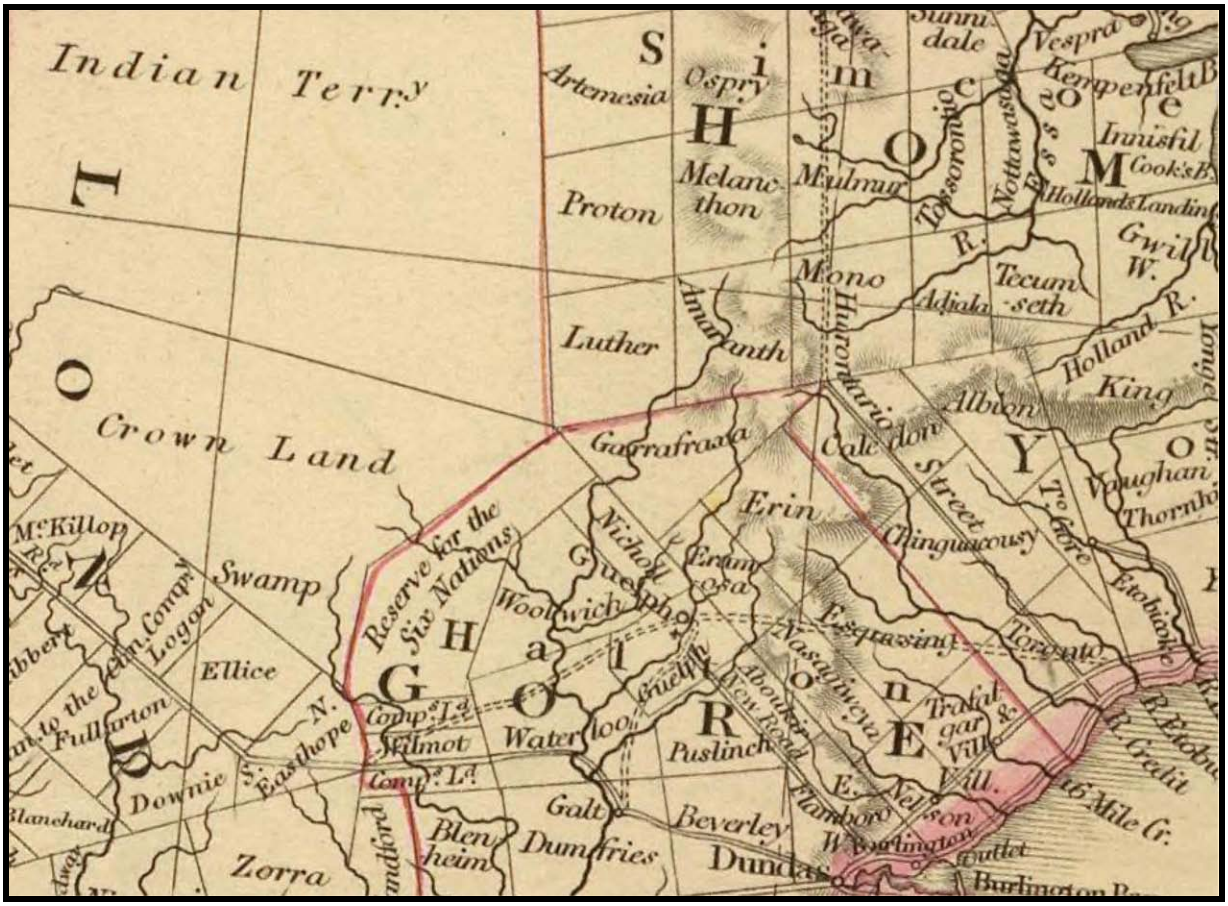

Figure 15: Detail from J. Arrowsmith's *Upper Canada* (1837)
(Cartography Associates 2009:David Rumsey Collection)

Settlement in the area was initially slow. The vast majority of the settlers were either English, Irish or Scottish (Smith 1846:213). These people faced a difficult existence, clearing forests, building structures, bartering for much needed supplies, and dealing with the difficult winters of backwoods Ontario. In the early 19th century, shanties and log cabins were the norm. These were subsequently followed by wood-framed or stone houses with large barns (Historical Atlas Publishing Co. 1906:2). Roads in the 1830's were dismal, according to early records, with the first settlers complaining of awful shaking, smashed bottles of whiskey, and an overall preference for walking unless grievously injured. Transportation via the province's extensive water systems remained preferable, for obvious reasons (Historical Atlas Publishing Co. 1906:2).

In 1838, further administrative changes were made, and the Wellington District was created from parts of the Gore, Home and London Districts (see Figure 16). This district housed the Counties of Wellington, Waterloo and Grey. Wellington County occupied an area of 652,578 acres and was very irregular in shape (see Figure 17), with numerous odd projections directly related to its diverse history of administrative and political change (Historical Atlas Publishing Co. 1906:1).

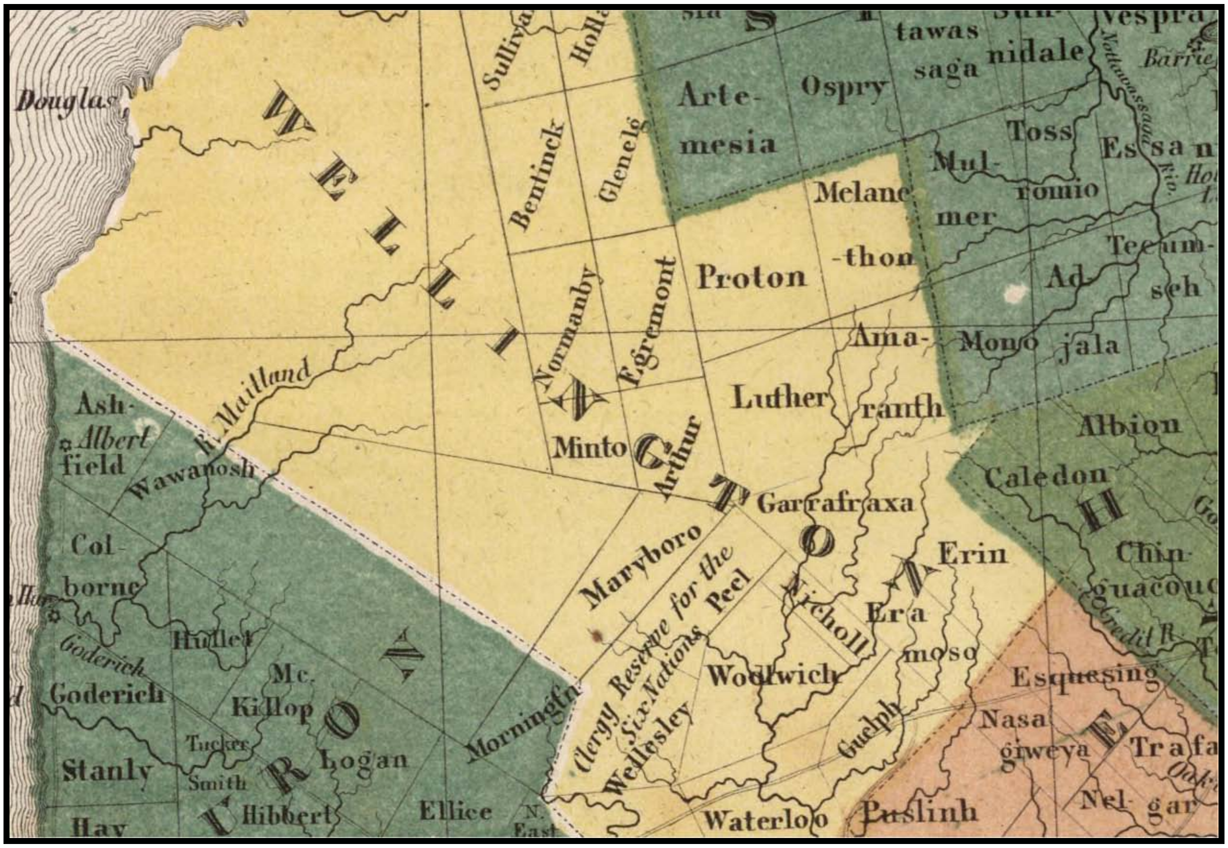

Figure 16: Detail from J. Calvin Smith's *Ontario, Canada* (1852)
(Cartography Associates 2009:David Rumsey Collection)

At that time Wellington County contained the Townships of Amaranth, Arthur (including Minto and Luther), Eramosa, Erin, Garafraxa, Guelph, Maryborough, Nichol, Peel, Pilkington and Puslinch. Guelph, Galt and Fergus were the primary contestants for the county seat, but it was Guelph that emerged as the leading city of the new polity. Arrangements were then made for the construction of the district's own Court House and Jail, and the contracts were awarded to William Allen and William Day, respectively. The first meeting of the District Council was held in the Court House on Feb 8, 1842, but numerous members were disqualified due to electoral irregularities and a special session had to be held again on April 14, 1842 (Historical Atlas Publishing Co. 1906:2).

With improved circumstances came an increase in settlement, and some 15,000 acres of land were brought under cultivation between 1842 and 1844 (Smith 1846:214). Eventually, the desire for gravelled roads led to the passing of a bylaw on Dec 16, 1847 geared towards improvements to Brock Road, from Dundas to Guelph. On June 14, 1851 another bylaw supported the development of the Elora and Saugeen Road. Other roads quickly followed suit, and the surrounding townships began to develop and expand their infrastructure, further adding to the attractiveness of settlement in Wellington County (Historical Atlas Publishing Co. 1906:2).

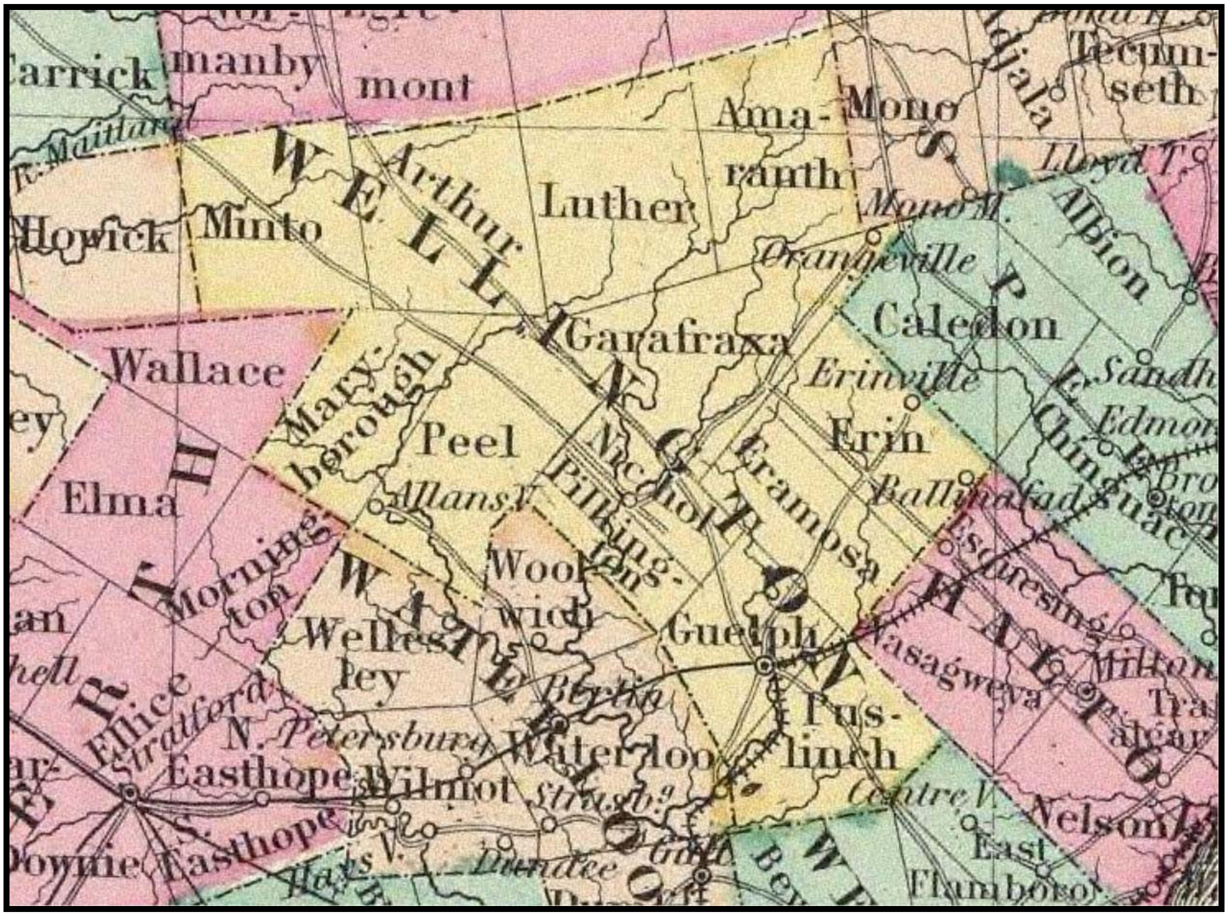

Figure 17: Detail from G.W. Colton's *Canada West* (1856)
(Cartography Associates 2009:David Rumsey Collection)

Railway construction in the area began in 1851, and on Jan 20, 1852 the first train carrying visitors and dignitaries arrived at York Road Bridge, along the CN Railway's Toronto and Guelph line. This rail system ushered in a great era of prosperity for Guelph and Wellington County, and it accommodated a rush of immigrants seeking lands in the north. Additional lines were soon to follow, and by 1870 railways reached Fergus and Harriston, with further expansion to Southampton by 1872. The Wiarton and Owen Sound rail branches diverged at Harriston, while the Stratford and Lake Huron line passed through Palmerston, contributing to the growth of both communities. The Toronto, Grey and Bruce Railway opened in 1871, running trains to Mount Forest, and in 1880 the Credit Valley railway passing through Erin and Garafraxa was completed (Historical Atlas Publishing Co. 1906:2).

The northern Townships of Minto, Arthur, Luther and Amaranth were home to significant historic communities such as Harriston, Palmerston, Mount Forest, Arthur, Kenilworth, Luther and Laurel. In central Wellington County the Townships of Maryborough, Peel, Garafraxa and Erin had population centres at Rothsay, Drayton, Glenallan, Alma, Garafraxa, Erin and Hillsburg. The southern Townships of Pilkington, Nichol, Eramosa, Guelph and Puslinch housed communities such as Elora, Fergus, Eramosa, Eden Mills, Morriston and, of course, the Town of Guelph (see Figure 18). Fergus and Elora were both founded at mill sites on the Grand River, and Eden Mills, Rockwood and Everton had a similar history on the Eramosa River (Chapman and Putnam 1984:139).

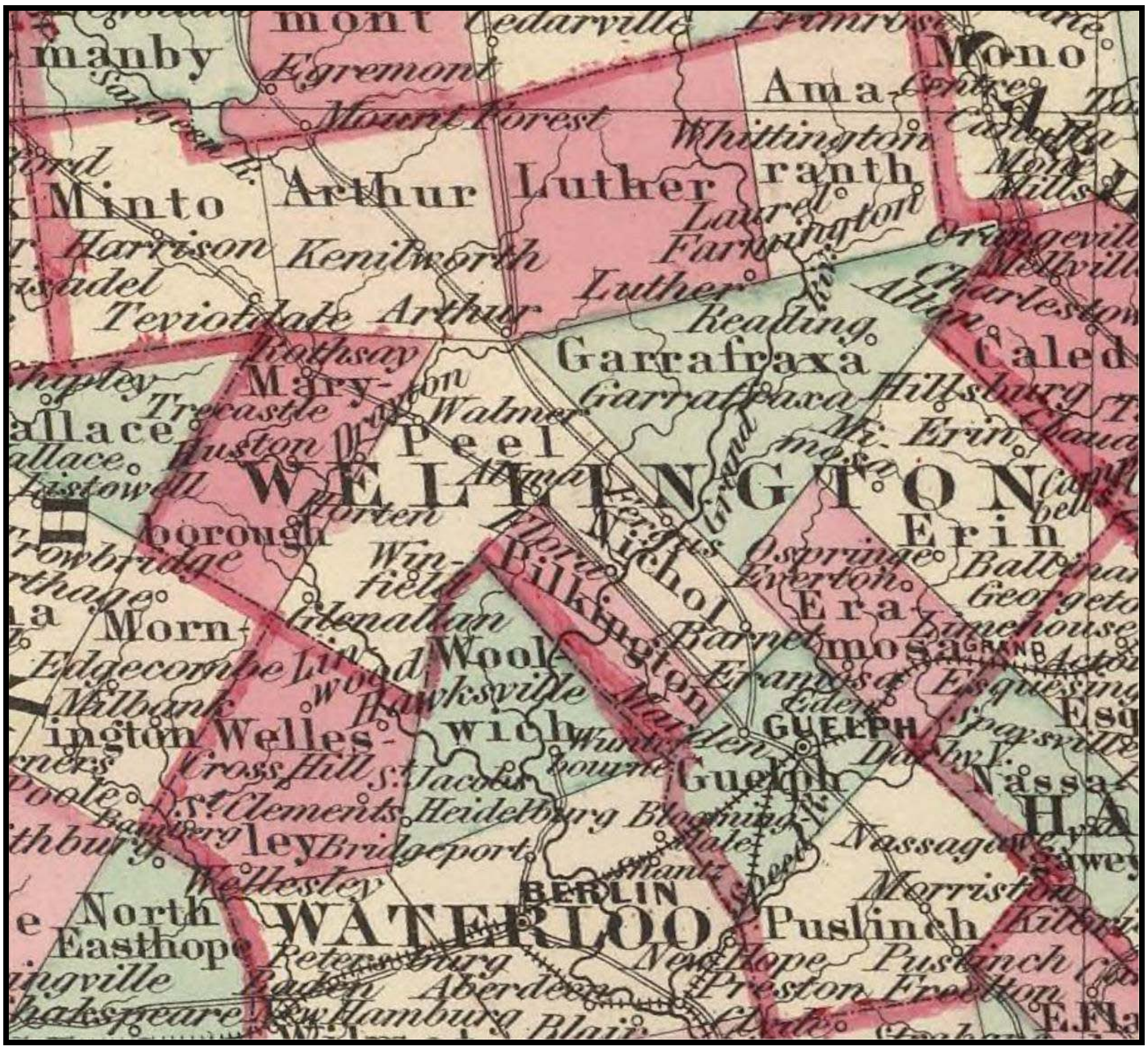

Figure 18: Detail from A.J. Johnson's *Ontario, of the Dominion of Canada* (1874)
(Cartography Associates 2009:David Rumsey Collection)

The Town of Guelph, founded in 1827 by John Galt on a block of land belonging to the Canada Company, gradually emerged as the cultural and commercial centre of the region (Smith 1846:213). Situated on a gravel terrace at the confluence of the Speed and Eramosa Rivers, the community of Guelph grew quickly over the 19th century and quickly spread over the surrounding hills. Many of the prominent features of the town were situated on large drumlins, including the Roman Catholic cathedral at the end of Macdonald Street and the hospitals and cemeteries to the east of the Speed River. The educational hub of Guelph, including the Ontario Agricultural College and later the Macdonald Institute, the Ontario Veterinary College and University of Guelph, occupied additional drumlins to the south. The town's industry initially developed primarily on more level ground adjacent to the Eramosa River (southeast of the city core), but later spread to the northwest as the town developed into a city (Chapman and Putnam 1984:138-139). Guelph will be discussed in greater detail below.

Wellington County would eventually be reduced in size, as municipal rearrangements saw the removal of Amaranth and East Garafraxa to Dufferin County in 1881, and the further addition of East Luther to Dufferin County in 1883 (Historical Atlas Publishing Co. 1906:2). Census records from the late 19th century indicate that the population peak during the historic Euro-Canadian era took place in 1881, with a population of 64,641. Between 1881 and 1921 there was a general decline in population, down to 54,160 people, but from 1921 onwards the population steadily rose, reaching 59,453 in 1941 and 66,903 in 1951. As of 1956, the population was 75,791, 36% of which was rural but only 24% of which actually lived on farms (Hoffman et al. 1963:8). Guelph continued to be the most significant community, with its mix of old world architecture, modern suburbs, and industry. It was also widely known for its centres of higher education (Hoffman et al. 1963:7).

5.3.2 The Township of Guelph

The Township of Guelph is bordered on the northeast by Eramosa Township, on the northwest by Nichol, Woolwich and Waterloo Townships, and on the southeast by Puslinch Township. It was initially patented in a block to the 'Canada Company' on July 9, 1829, a company of British developers with a fairly unique history. The Canada Company was first incorporated on August 19, 1826 by royal charter, and the developers were granted significant powers and privileges by King George IV. Among these powers was the ability to purchase large tracts of Crown lands and reserves, including the clergy reserves that would become the Townships of Guelph and Puslinch. The Canada Company would eventually come to possess nearly 2,300,000 acres of land in Upper Canada, subsequently selling them to early settlers (Historical Atlas Publishing Co. 1906:5).

The first settler of the Township of Guelph was Samuel Rife, who arrived with his family prior to the purchase in 1825 and squatted near the western limits of the future town. Other arrivals that year included the Hind and Ryan families, who settled near the developing Waterloo Road. Another group of Scottish settlers took a much more roundabout route to settle in Guelph Township. In 1825 these families, including the Stirtons, Kennedys, Roses, Peters, McDonalds, Reads, Wallaces, McCreas, Bucharts, McTavishs and Gillies, sailed to South America to settle. After a long and troublesome voyage they arrived at Caracas, Venezuela and found Spanish-speaking peoples along with new and strange customs; not at all close to their ideal vision of a new life. Many of these families then chose to emigrate to Canada, and early in 1827 they sailed to Philadelphia and subsequently arrived in Guelph some three months later. These families settled in what became known as the Scottish Block, and are the best documented pioneer settlers in Guelph Township (Historical Atlas Publishing Co. 1906:5-6).

The first settlers in the Paisley Block were the McCorkindales, Alexanders and Fergusons, who came from Scotland and purchased land from the Canada Company in 1829. Later arrivals would include Mandersons and Grieves (1830), Laidlaws, Elliotts, Cleghorns and Brydons (1831) and the Quarrys and Jacksons (1832). The wealthy Spier family arrived in 1832 and took possession of some 400 acres once belonging to their grandfather Robert Grieve. They were the first to own a team of horses in the area. The first school house was also on the Spier's farm (Historical Atlas Publishing Co. 1906:6).

The first road to be developed in Guelph Township was the Waterloo Road (called Broad Road at that time), which Absolom Shade began to clear in 1825 and completed by the time of the foundation of Guelph in 1827 (he subsequently would clear the road through Puslinch Township). The Elora Road was also partly cleared by that time as well, and the early settlers of the Paisley Block helped clear the old Guelph and Goderich road in 1829. The township was fully surveyed by John McDonald in 1830, and contained some 42,338 acres (Historical Atlas Publishing Co. 1906:5-6). The layout consisted of multiple divisions, with 1 concession in Division A (north of town), 5 concessions in Division B (west part of township), 12 concessions in Division C (east part of township), 6 concessions in Division D (north-central part of township), 2 concessions in Division E (west of town), 1 concession in Division F (northeast of town) and 5 concessions in Division G (south of town) (Historical Atlas Publishing Co. 1906:78-79).

Guelph Township was one of the best settled historic townships in southern Ontario, with the majority of settlers being well-established and wealthy English families primarily from Suffolk and Norfolk (Smith 1846:72). By the mid-19th century, 24,473 acres had been claimed, more than half of which (12,840 acres) was already under cultivation. The rolling landscape proved to be quite amenable to early farming, and excellent wheat crops are historically documented. The Township had three grist mills and two saw mills by the mid-19th century, most of which were in the major population centre of Guelph (Smith 1846:72-73).

5.3.3 The City of Guelph

The principle settlement in the Township of Guelph was the Town (later City) of Guelph itself, which as mentioned above was the District Seat of Wellington County. Guelph was founded on St. George's Day, April 23, 1827 by Scottish novelist and Company man John Galt, an occasion marked by the ceremonial felling of a large maple tree. Galt remarked, "to me at least the moment was impressive – and the silence of the wood that echoed to the sound was as the sign of the solemn genius of the wilderness departing forever" (Historical Atlas Publishing Co. 1906:3). The town he established ranks amongst the first planned settlements in Upper Canada. In fact, Galt designed the town to appeal to and attract early settlers, with a series of streets radiating from one focal point in a manner similar to European city centres, complete with squares, broad main streets and narrow side streets. The name 'Guelph' stemmed from one of the ancestral family names of King George IV, and the 'Royal City' was born (City of Guelph 2010).

James McDonald surveyed the site, using the stump of the historic tree as a benchmark, and the town streets were laid out "like the ribs of a lady's fan" (Historical Atlas Publishing Co. 1906:3). The first months were spent erecting log houses in different parts of town and clearing the land, with the largest clearings opening up at Market Square and eastward on Waterloo Street as far as Gordon Street. A grand opening celebration took place on August 13th, and a market-house was erected and used for the festivities. Roughly 500 people attended, and ox, potatoes, bread, tea and whiskey were communally consumed. The first stone structures followed, with the founding of a bank and a school house. A store was erected late in 1827, and a saw mill was established by 1830. The Canada Company printed the following 'Instructions to Emigrants' in 1830:

> *A town called Guelph has been built in a central situation on one of the most considerable of these blocks in the Gore District, and roads have been opened to the townships around; and one main road is now in operation from Guelph to Dundas, 24 miles, which latter place will become the depot for all grain raised in the back townships, fetching, with the mere difference of carriage, as high a price there as at Flamborough, which is 20 miles distant from Guelph, as at York, where it is shipped for the Montreal market. Upwards of 200 houses are now built; a first-rate stone grist mill will be in operation in January, 1831; there are several taverns where board and lodging may be procured on moderate terms; and tradesmen of most descriptions are among its inhabitants, which amount to about 800* (Historical Atlas Publishing Co. 1906:3-4).

Unfortunately for the Galt and the Canada Company, Guelph did not grow as rapidly as initially expected, but a substantial community did develop. Smith describes the settlement as being "in the midst of a finely undulating country ... high, dry and healthy" (1846:72). As District Seat, Guelph also had a jail and court house, both of which were stone built but situated somewhat outside of the heart of the settlement. Numerous government and District offices were also located here, including the Judge of the District Court, Sheriff, Clerk of Peace, Treasurer, Inspector of Licenses, District Clerk, Clerk of District Court and the Deputy Clerk of Crown (Smith 1846:72).

By the mid-19th century, three local newspapers were in circulation, including the 'Guelph and Galt Advertiser', the 'Guelph Herald' and the 'Guelph Mercury'. Stages ran daily to Preston and Galt, and the town had a population of some 1,240 (mainly English and Scottish with some Irish). At that time Guelph boasted some seven taverns (the British Hotel, Farmer's Arms and

Ratcliffe's being the most prominent), five churches, four physicians, three grist mills, one saw mill, three tanneries, fifteen stores, six blacksmiths, six wagon makers, eight cabinet makers, ten tailors, thirteen shoemakers, two undertakers, two schools and two banks, plus dozens of other professions both large and small (Smith 1846:72).

In 1851 Guelph received a village charter, and on January 30, 1852 the first train arrived in Guelph from Toronto, ushering in an era of growth and prosperity (see Figure 19). Significant developments then took place, and some of the town's most prominent buildings were erected, designed by both Toronto-based and local architects (City of Guelph 2010). In 1856 Guelph was incorporated into a town, and populations subsequently soared to nearly 5,000 in 1865, over 6,000 in 1870 and over 8,000 in 1875. In 1879 the Town was incorporated into a City with a population of 10,000. At the turn of the 20th century the City of Guelph boasted some 12,000 inhabitants, and it was a prosperous manufacturing and commercial centre and a key distribution point for trade (Historical Atlas Publishing Co. 1906:4).

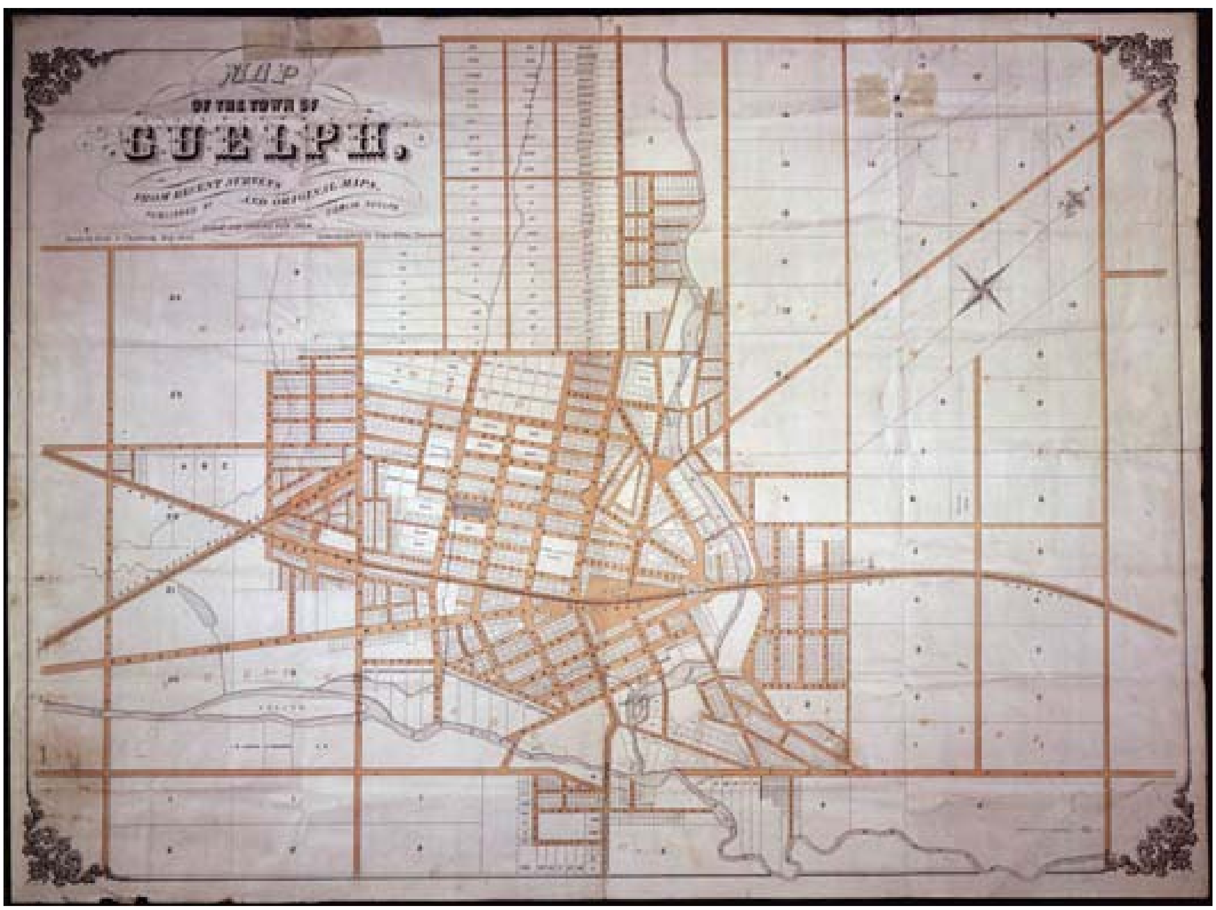

Figure 19: J.Smith's *Map of the Town of Guelph* (1855)
(Archives of Ontario 2009)

5.3.4 The Study Area

The proposed area of impact for the City of Guelph's Watermain and Trunk Sewer reconstruction falls partly within the Township of Guelph and partly within the Town (later City) of Guelph. Those areas of the latter include approximately 75 lots in and around St. Andrews' Ward, St. James' Ward and St. Patrick's Ward (see Figure 20, Table 2).

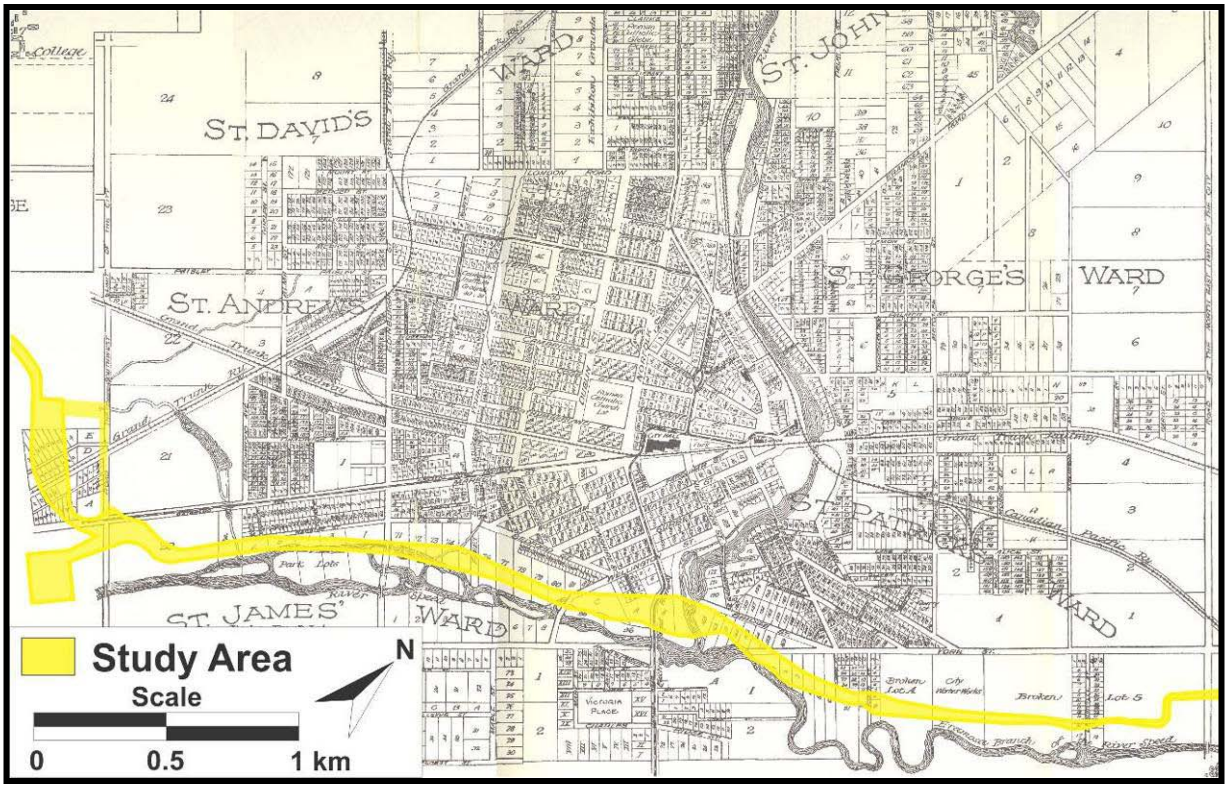

Figure 20: Detail from the Historical Atlas Publishing Co.'s *Historical Atlas of Wellington County* (1906), Showing the Study Area within the Historic City Limits
(Historical Atlas Publishing Co. 1906:84-85)

Table 2: Historic Town Lots (1906) Within or Immediately Adjacent to the Study Area
(Historical Atlas Publishing Co. 1906:84-85)

Area	Lot/Lots
Subdivision North of Grand Trunk (Lot 2, Concession 1-E)	1-17
Subdivision South of Grand Trunk (Lot 2, Concession 1-E)	1-6, 13-15
St. James' Ward	20
St. James' Ward	2A
Park Lots	1-6
St. James' Ward	71-81, 95-96
St. James' Ward	C, A

St. Patrick's Ward	A
St. Patrick's Ward	162-169
Eramosa Front Lots	1-6
Hooper Street Lots	7-11, 31
St. Patrick's Ward	Broken Lot A
St. Patrick's Ward	City Waterworks
St. Patrick's Ward	Broken Lot 5
Brockville Street Lots	15-20

Outside of the town (later city) limits of Guelph, the majority of the study area falls within 12 farm lots (see Figures 21-22, Table 3). Although the study corridor falls partly within existing historic road allowances, some sections pass in close proximity to noted historic structures. These include the homesteads of G. Sandilands on Lot 3, Concession 1-E and J. Hewitt on Lot 1, Concession 1-E, documented in 1877. From that same year, a school house is noted on R. Cochrane`s Lot 5, Concession 2-C just south of the study area. The 1906 atlas reveals the presence of additional historic structures on Lot 1, Concession 1-E, in the Galt Subdivision on Lot 3, Concession 2-C and on Valentine Bielski's Lot 5, Concession 3-C.

Figure 21: Detail from Walker & Miles *Illustrated Atlas of Wellington* (1877), Showing the Study Area
(McGill 2001:The Canadian County Atlas Digital Project)

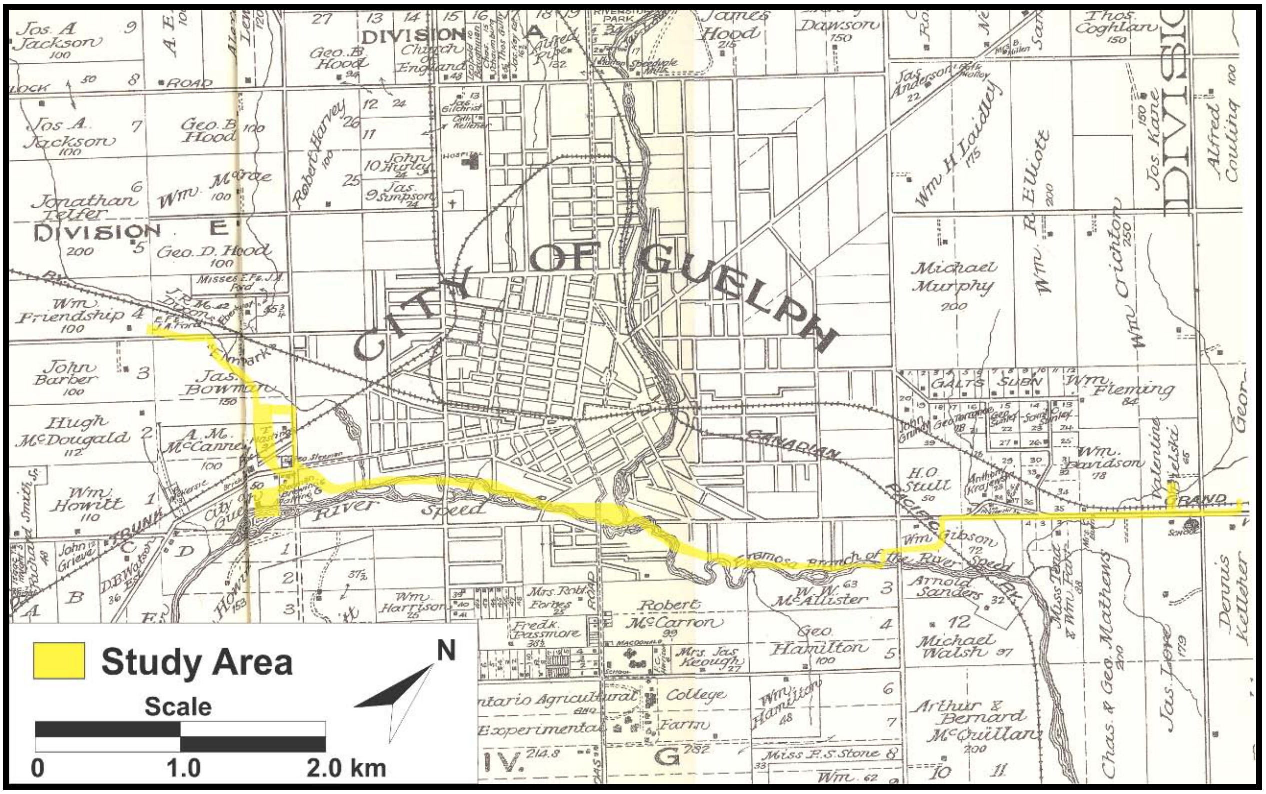

Figure 22: Detail from the Historical Atlas Publishing Co.'s *Historical Atlas of Wellington County* (1906), Showing the Study Area
(Historical Atlas Publishing Co. 1906:78-79)

Table 3: Historic Township Lots (1877 and 1906) Within or Immediately Adjacent to the Study Area
(Historical Atlas Publishing Co. 1906:78-79; McGill 2001:The Canadian County Atlas Digital Project)

Division	Lot	Concession	Owner (1877)	Owner (1906)
E	4	1	J. Ford	E.F. and J.A. Ford
E	3	1	G. Sandilands	Jason Bowman
E	2	1	J. Hewitt	Jason Bowman, A.M. McCannell, T. Hastings and Subdivision Lots
E	1	1	J. Hewitt	A.M. McCannell, City of Guelph, Sleeman Brewing and Malting
C	1	2	D. Cameron	William Gibson
C	2	2	D. Cameron	William Gibson
C	3	2	D.G. Farr	Galt Subdivision
C	4	2	H. Matthews	C. and G. Matthews
C	5	2	R. Cochrane	Jason Love
C	6	2	D. Kelcher	D. Kelleher
C	5	3	Mrs. Duggan	Valentine Bielski
C	6	3	George H. Carter	George H. Carter

6.0 Archaeological Potential

In addition to the relevant historical sources and the results of past excavations and surveys, the archaeological potential of a property can be assessed using its soils, hydrology and landforms as considerations. Young et al. note that, "either the number of streams and/or stream order is always a significant factor in the positive prediction of site presence" (1995:23). They further note that certain types of landforms, such as moraines, seem to have been favoured by different groups throughout prehistory (Young et al. 1995:33). According to several researchers, such as Janusas (1988:1), "the location of early settlements tended to be dominated by the proximity to reliable and potable water resources." Site potential modeling studies (Peters 1986; Pihl 1986) have found that most prehistoric archaeological sites are located within 300 m of either extant water sources or former bodies of water, such as post-glacial lakes. The Ministry of Tourism and Culture (Ontario Ministry of Culture 2005:12-13) accordingly identifies high potential First Nation sites within 300 m of a primary water source and 200 m of a secondary water source.

While many of these studies do not go into detail as to the basis for this pattern, Young et al. (1995) suggest that the presence of streams is a significant attractor for a host of plant, game, and fish species which in turn encourage human settlement in an area. Additionally, lands in close proximity to streams and other water courses were valued as they offered access to transportation and communication routes. Other factors attracting prehistoric settlement include the presence of well-drained soils (for habitation and agriculture), elevated knolls and ridges, unique landforms (waterfalls, rocky outcrops, caverns) and valued natural resources (raw materials, concentrations of specific flora/fauna). Conversely, it must be understood that non-habitational sites (e.g. burials, lithic quarries, kill sites, etc.) may be located anywhere. Potential modeling appears to break down when it comes to these idiosyncratic sites, many of which have more significance than their habitational counterparts as a result of their relative rarity.

With the development of integrated 'complex' economies in the Historic (or Euro-Canadian) era, settlement tended to become less dependent upon local resource procurement/production and more tied to wider economic networks. As such, proximity to transportation routes (roads, canals, etc) became the most significant predictor of site location, especially for Euro-Canadian populations. In the early Historic era (pre-1850), when transport by water was the norm, sites tended to be situated along major rivers and creeks - the 'highways' of their day. With the opening of the interior of the Province of Ontario to settlement after about 1850, sites tended to be more commonly located along historically-surveyed roads. Positive potential for Historic archaeological materials can also be inferred by proximity to documented historic structures (churches, cemeteries, houses) and locations associated with historic events.

Based on the study area's location, drainage, topography and land-use, it seems clear that it would, in its pristine state, have a high potential for the presence of both Pre-Contact and Euro-Canadian era sites. Its potential for Pre-Contact sites is high due to its proximity to the Speed and Eramosa Rivers. The study area's potential for historic Euro-Canadian Historic sites is similarly high due to its proximity to numerous historically-surveyed thoroughfares, which would have been significant settlement attractors. In sum, much of the study area has the potential to yield sites which span Ontario's entire archaeological history.

That being said, the fact that much of the project area has been developed for infrastructural, commercial and recreational purposes greatly reduces its archaeological potential. Large portions of the corridor have been disturbed by previous development, including culverts, ditches, stripped areas, paved areas, gravelled driveways, parking lots, construction sites and man-made paths, none of which retain any of their original archaeological potential (see Plates 1-6). Other areas are steeply sloped, and as such exhibit no archaeological potential (see Plate 7). Areas of uncertain archaeological potential include soccer fields, landscaped areas and lands which may have been modified by adjacent construction activities (see Plates 8-15). The extent of disturbance in these areas needs to be established empirically before they can be excluded from further heritage concerns. High potential areas were largely restricted to project lands where previous impacts were not evident, notably along the Eramosa River (see Plate 16-18).

It is unlikely that archaeological assessments were carried out on any developments in the area which pre-date the cultural heritage provisions of the Planning Act. As such, it is possible that there may be some pockets within these lands that have been less disturbed (or even missed entirely) by archaeologically-destructive impacts. With these factors in mind, the archaeological potential of the study area has been assessed and mapped accordingly (see Appendix).

Plate 1: Area of No Archaeological Potential South of Wellington St. W. (Facing East)

Plate 2: Area of No Archaeological Potential South of Waterworks Pl. (Facing West)

Plate 3: Area of No Archaeological Potential South of York Rd. (Facing West)

Plate 4: Area of No Archaeological Potential North of York Rd. (Facing East)

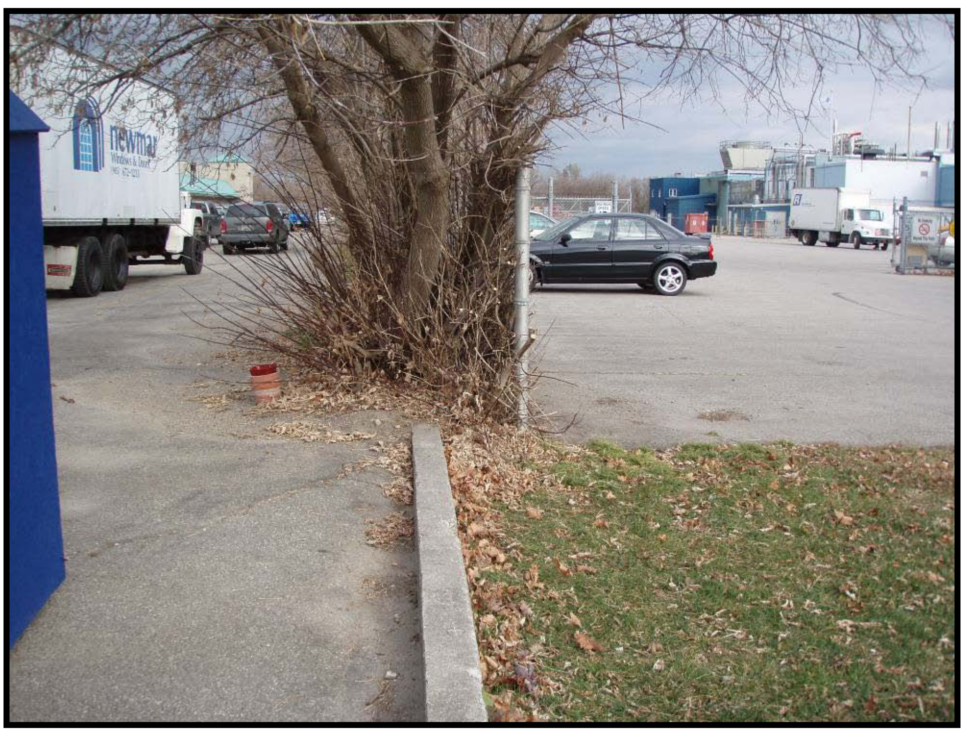

Plate 5: Area of No Archaeological Potential East of Victoria Rd. S. (Facing East)

Plate 6: Area of No Archaeological Potential North of Wellington St. W. (Facing West)

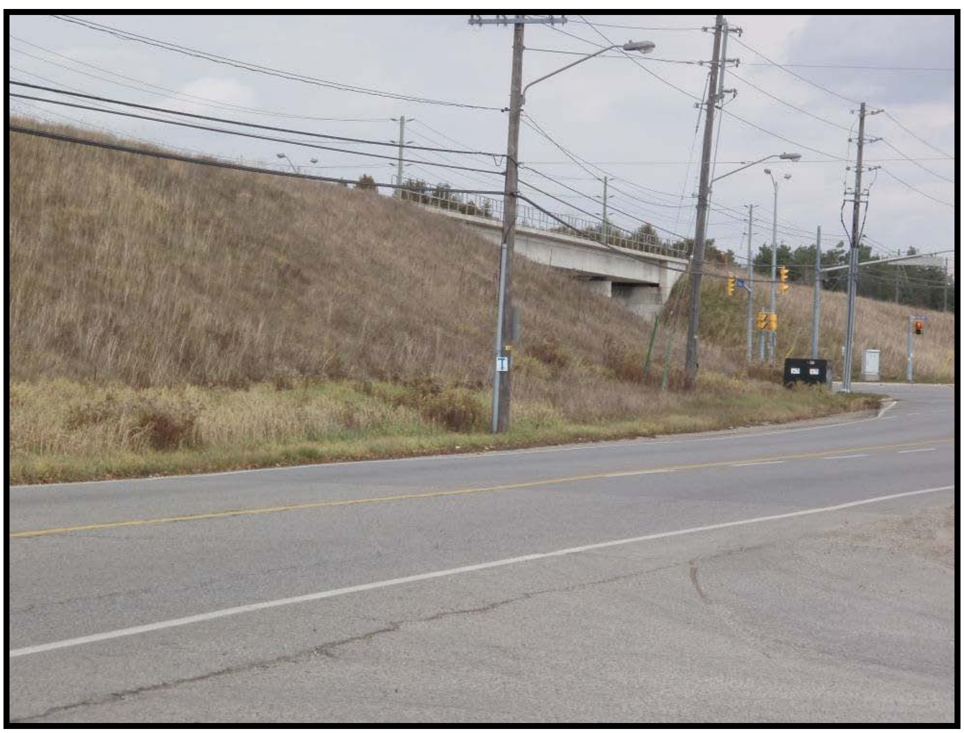

Plate 7: Area of No Archaeological Potential North of York Rd. (Facing Northeast)

Plate 8: Area of Uncertain Archaeological Potential South of York Rd. (Facing West)

Plate 9: Area of Uncertain Archaeological Potential East of Gordon St. (Facing Southeast)

Plate 10: Area of Uncertain Archaeological Potential South of Hood St. (Facing East)

Plate 11: Area of Uncertain Archaeological Potential South of York Rd. (Facing East)

Plate 12: Area of Uncertain Archaeological Potential South of Paisley Rd. (Facing West)

Plate 13: Area of Uncertain Archaeological Potential South of Hwy 6 (Facing Southeast)

Plate 14: Area of Uncertain Archaeological Potential South of York Rd. (Facing West)

Plate 15: Area of Uncertain Archaeological Potential East of McCrae Blvd. (Facing West)

Plate 16: Area of High Archaeological Potential at North of Eramosa River (Facing West)

Plate 17: Area of High Archaeological Potential South of Kingsmill Ave. (Facing Southwest)

Plate 18: Area of High Archaeological Potential South of York Rd. (Facing East)

7.0 Results and Recommendations

The Stage 1 archaeological assessment of lands with the potential to be impacted by the proposed infrastructure improvements was completed in November of 2010. The assessment identified several archaeological factors which should be considered in the project planning process. These include:

- The location of the study area along historically-surveyed roads;
- The proximity of the study area to the Speed and Eramosa Rivers, both permanent and significant water sources;
- The high number of registered archaeological sites located within 2 km of the study area;
- The high archaeological potential for both Pre-Contact and Euro-Canadian materials in the undeveloped parts of the study area.

In sum, the Stage 1 archaeological assessment indicates that the study area, in its pristine state, would have a high potential for both Pre-Contact and historic Euro-Canadian sites. Modern development in the City of Guelph has negatively impacted this potential in many parts of the study area. High potential areas are largely restricted to undeveloped lands adjacent to Eramosa River. Areas of uncertain archaeological potential were also identified, concentrated in somewhat developed and significantly developed lands, respectively. Fully developed parts of the study area retain none of their original high potential (see Appendix).

Based on the results of the Stage 1 assessment, **Archaeological Research Associates Ltd. (ARA)** recommends that a Stage 2 archaeological assessment be undertaken on all lands within the study area that retain any archaeological potential. Such an assessment will be able to confirm the presence or absence of materials with cultural heritage value or interest on the subject lands. A **Letter of Concurrence** with these recommendations is requested.

This report is filed with the Minister of Tourism and Culture as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report will be reviewed to ensure that the licenced consultant archaeologist has met the terms and conditions of their archaeological licence, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario.

Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licenced consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*. This condition provides for the potential for deeply buried or enigmatic local site areas not typically identified in evaluations of potential.

The Cemeteries Act requires that any person discovering human remains must immediately notify the police or coroner and the Registrar of Cemeteries, Ministry of Small Business and Consumer Services. All work in the vicinity of the discovery will be suspended immediately. Other government staff may be contacted as appropriate; however, media contact should not be made in regard to the discovery.

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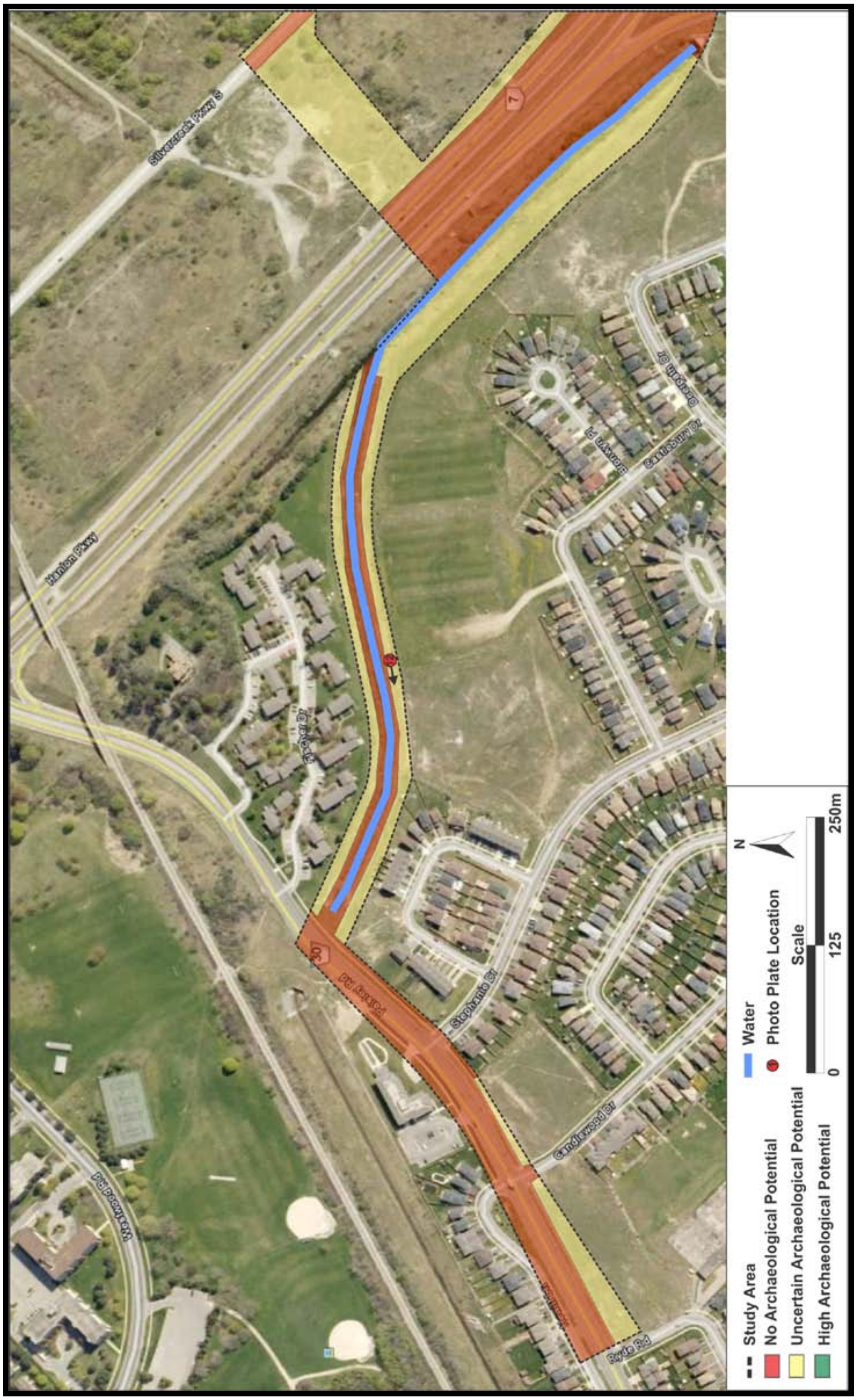
Appendix: Study Area in Detail, Showing Zones of Archaeological Potential



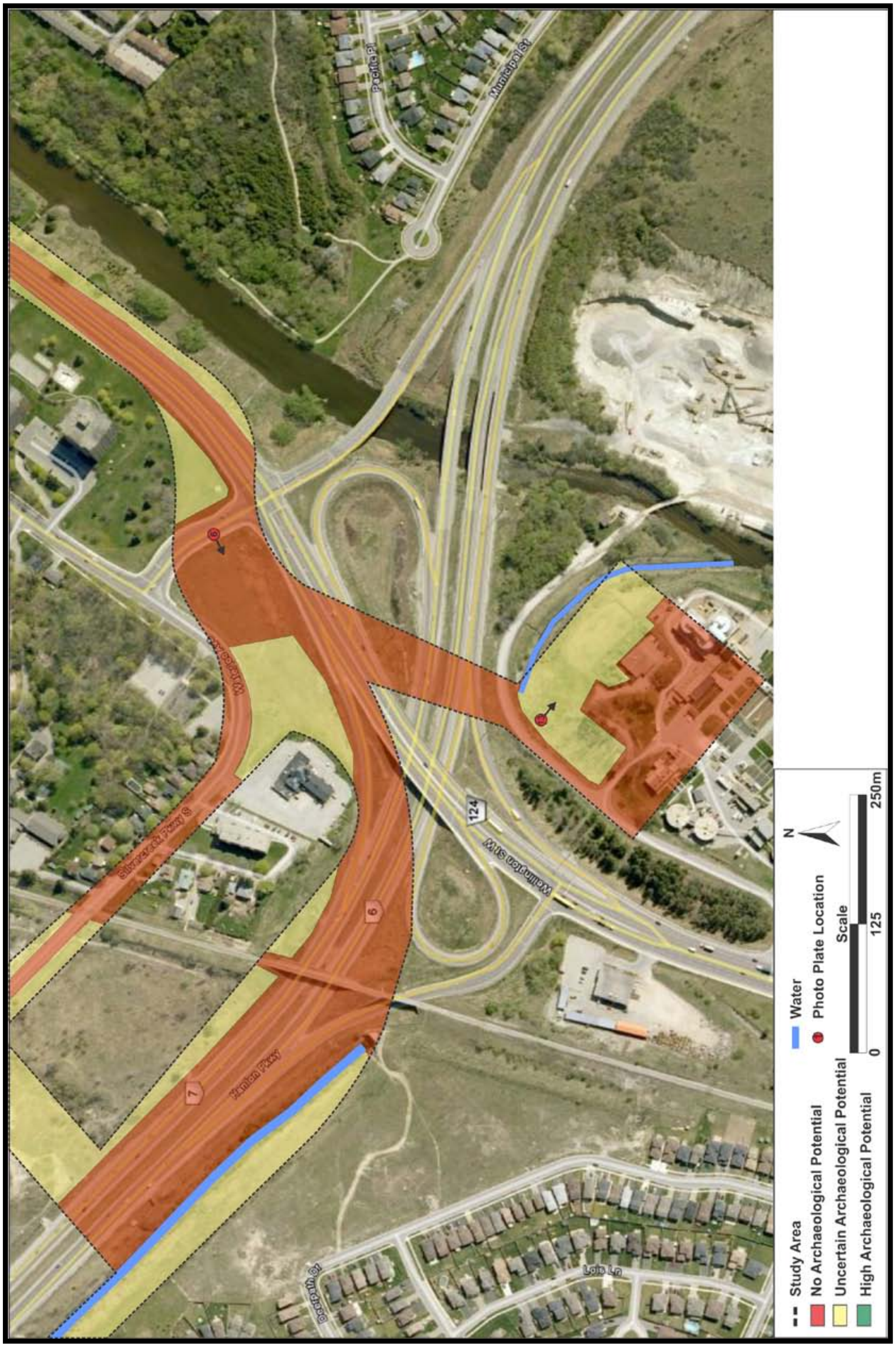

Study Area
No Archaeological Potential
Uncertain Archaeological Potential
High Archaeological Potential
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Photo Plate Location
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Study Area
No Archaeological Potential
Uncertain Archaeological Potential
High Archaeological Potential
Water
Photo Plate Location
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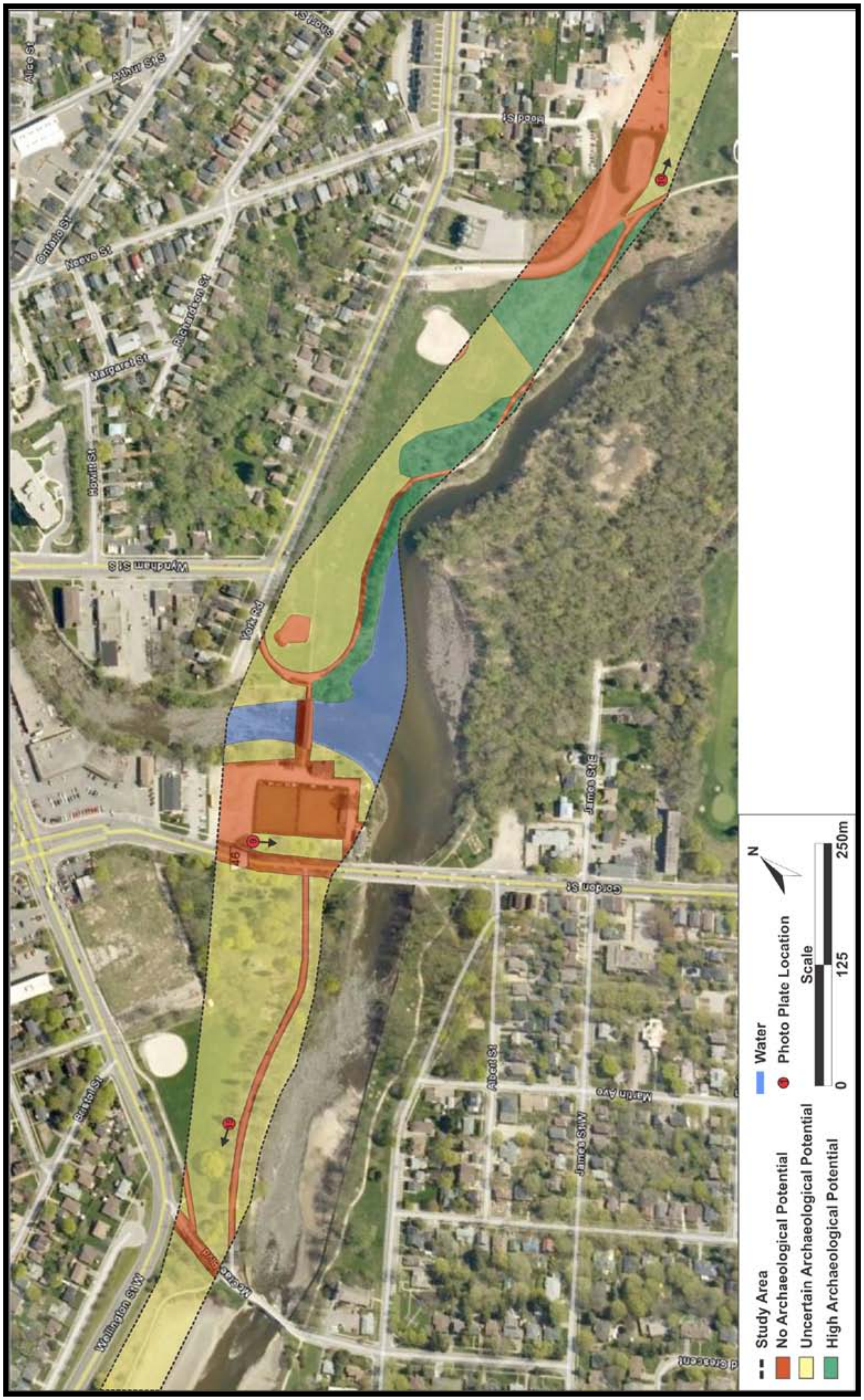
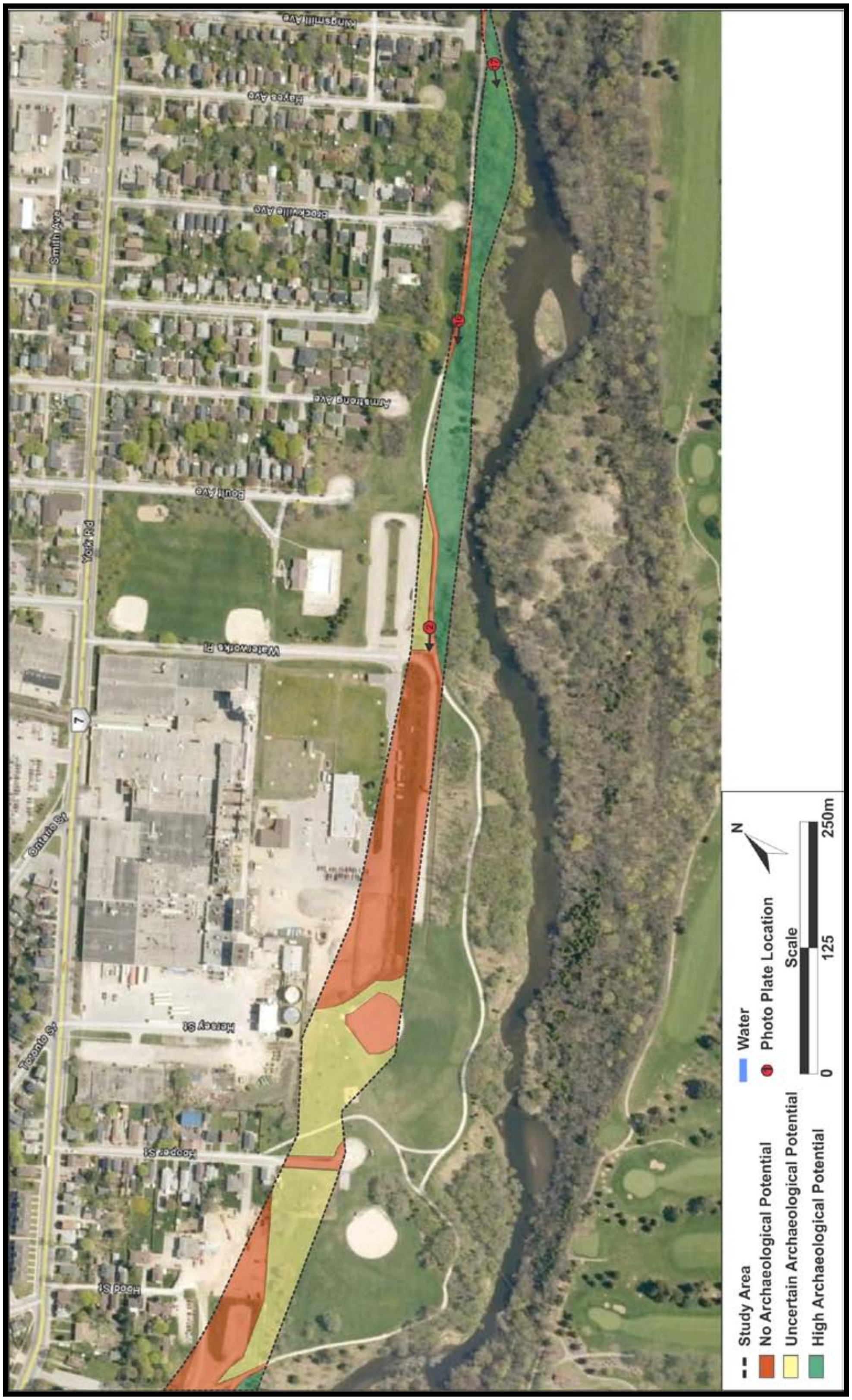
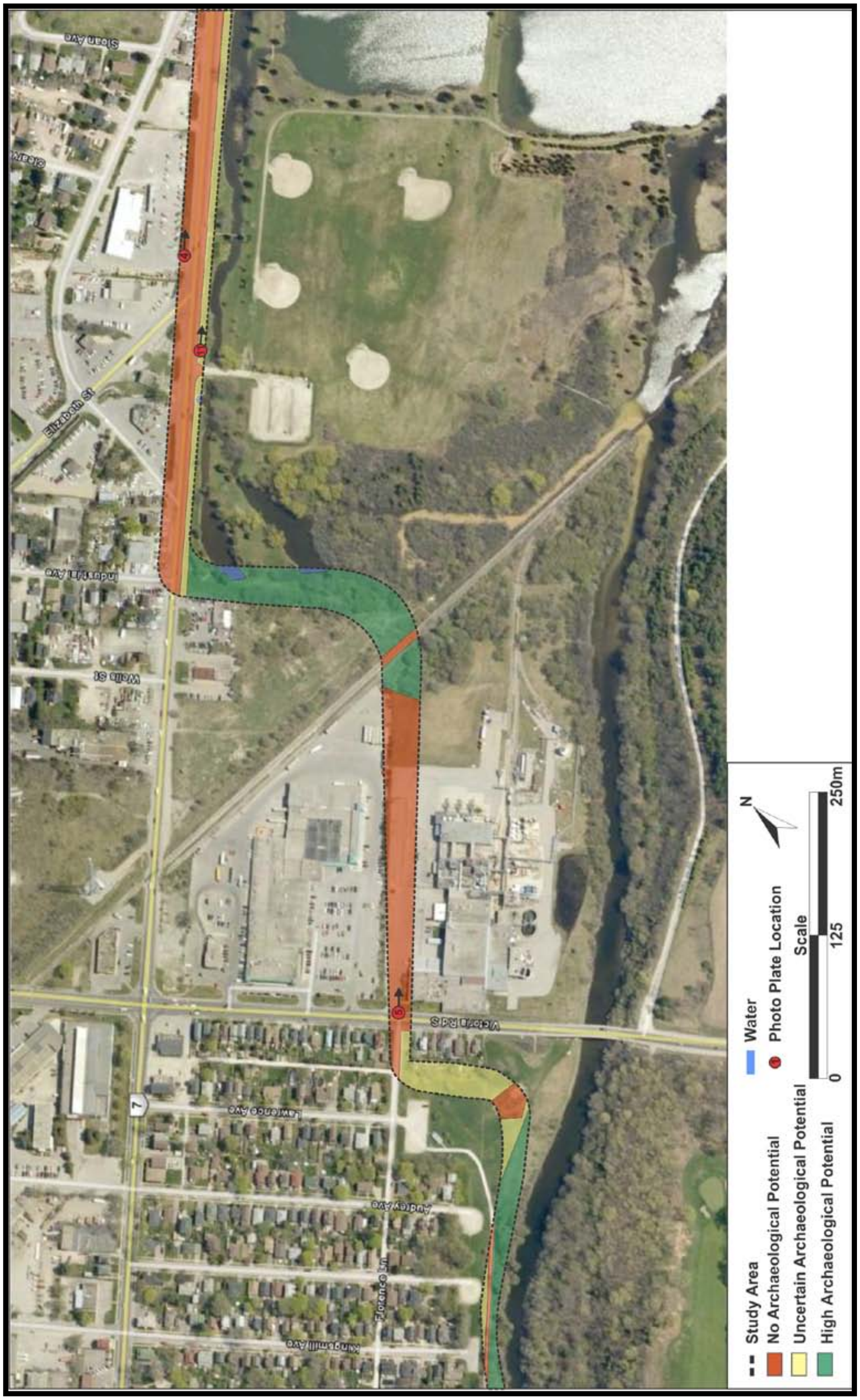

Study Area
No Archaeological Potential
Uncertain Archaeological Potential
High Archaeological Potential
Water
Photo Plate Location
Scale
0
125
250m
N


Study Area
No Archaeological Potential
Uncertain Archaeological Potential
High Archaeological Potential
Water
Photo Plate Location
Scale
0
125
250m
N
York Rd
Smith Ave
Kingsmill Ave
Hayes Ave
Brockville Ave
Armstrong Ave
Waterworks Pl
Ontario St
Toronto St
Hooper St
Hood St


Sloan Ave
Elizabeth St
Industrial Ave
Wells St
Victoria Rd S
Lawrence Ave
Audrey Ave
Florence Ln
Kingsmill Ave
Study Area
No Archaeological Potential
Uncertain Archaeological Potential
High Archaeological Potential
Water
Photo Plate Location
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Scale
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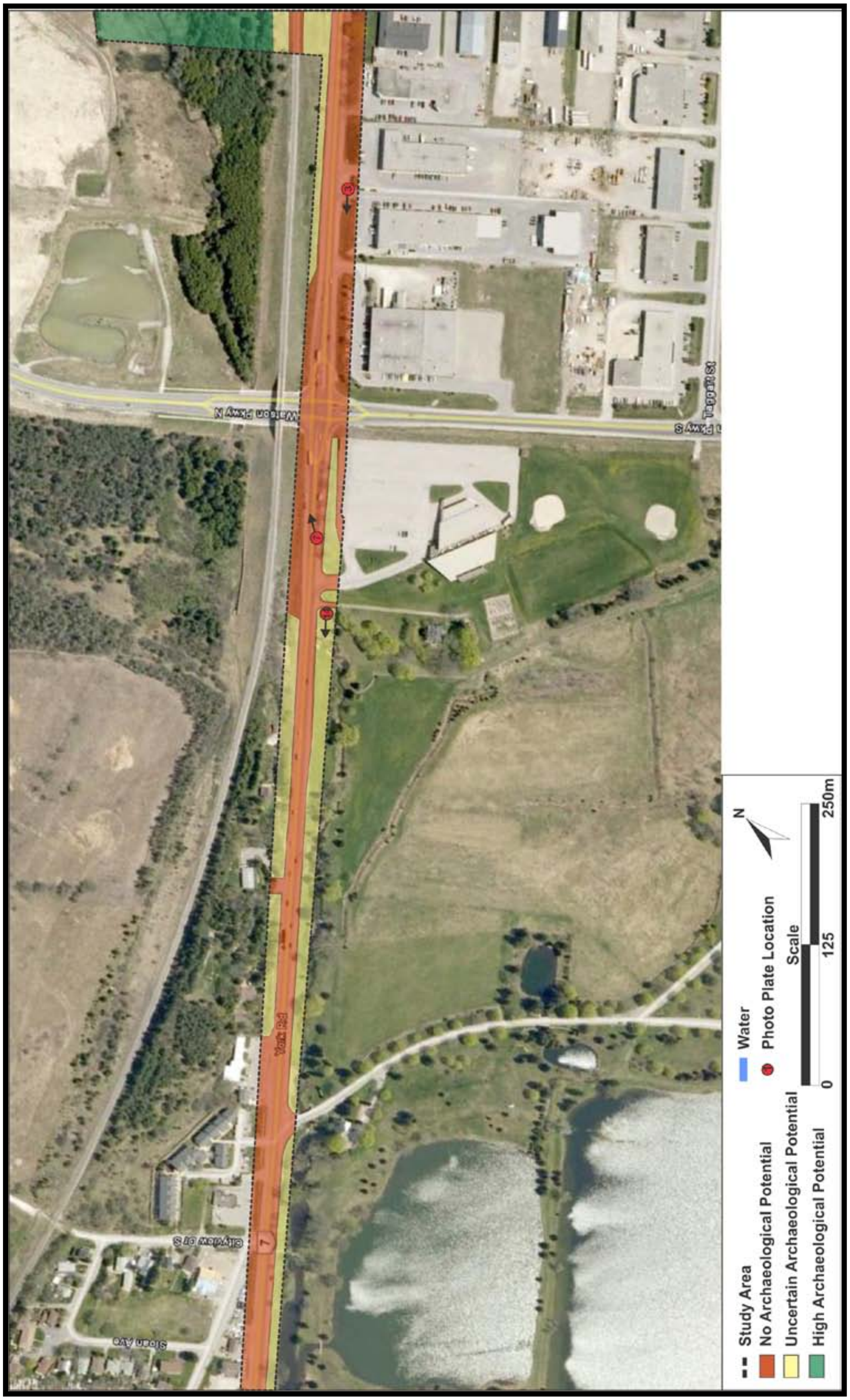
250m


Study Area
No Archaeological Potential
Uncertain Archaeological Potential
High Archaeological Potential
Water
Photo Plate Location
Scale
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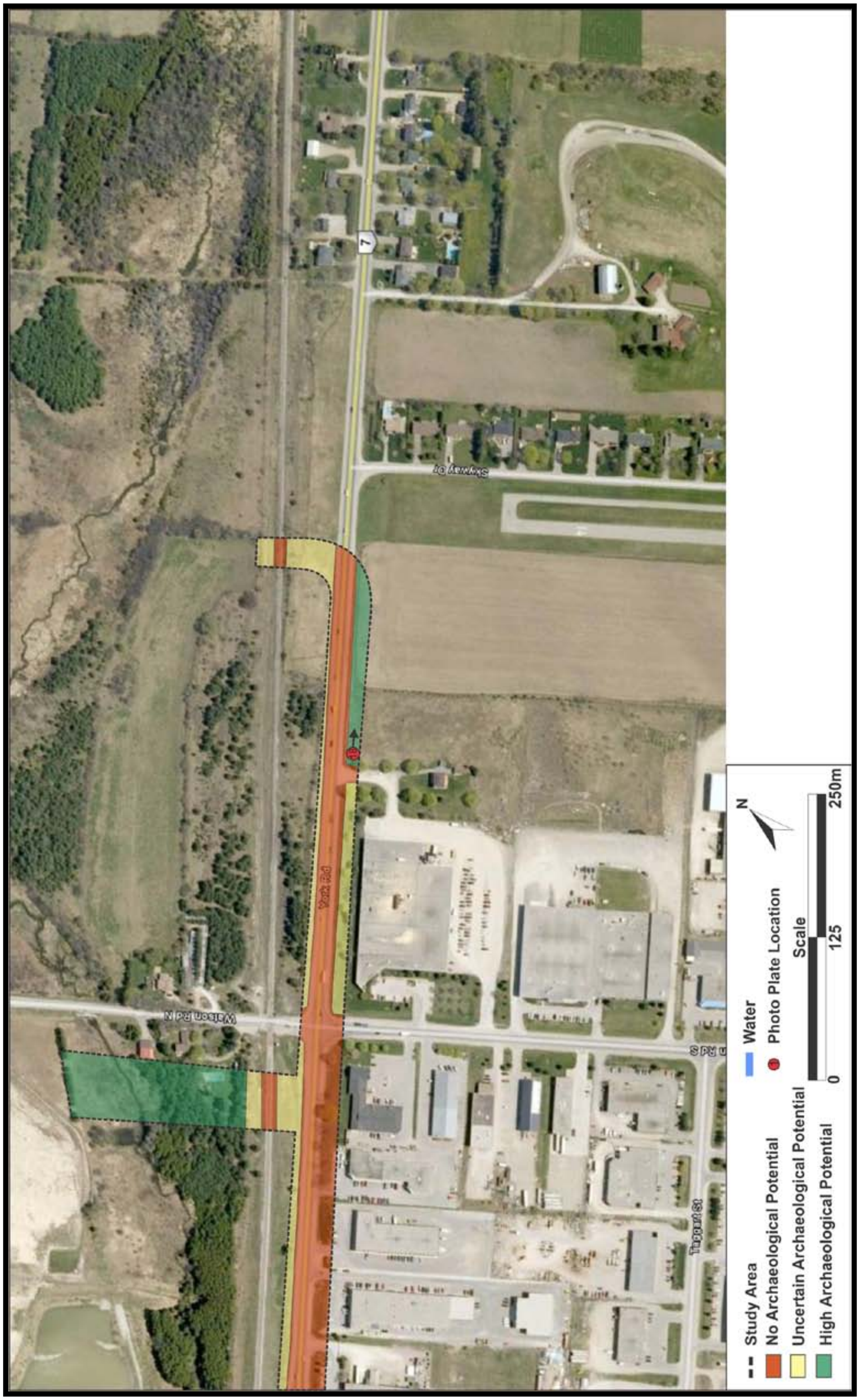
250m
N
Watson Pkwy N
York Rd
Cityview Dr S
Sloan Ave


Study Area
No Archaeological Potential
Uncertain Archaeological Potential
High Archaeological Potential
Water
Photo Plate Location
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Scale
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125
250m

Appendix C

Notice of Commencement

NOTICE OF COMMENCEMENT AND INVITATION TO PARTICIPATE

York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment

The projects

The City of Guelph is initiating a Class Environmental Assessment study for improvements to the York Trunk Sanitary Sewer and a new drinking water feedermain for the Paisley and Clythe Reservoirs. The 2009 Water and Wastewater Servicing Master Plan (WWSMP) identified the need for these improvements in order to service planned growth in the city.

The current York Trunk Sanitary Sewer extends from the former Guelph Reformatory Lands to the Wastewater Treatment Plant west of the Hanlon Expressway along the Eramosa and Speed Rivers. According to the findings of the WWSMP, this sewer is reaching the end of its useful life and capacity due a combination of planned population and employment growth in the city and reports of poor condition in sections. A solution is required to replace and/or rehabilitate this main trunk sewer.

The Paisley-Clythe Drinking Water Feedermain is a new watermain recommended in the WWSMP to increase the reliability of the supply between the F.M. Woods Reservoir and Pumping Station and the Paisley and Clythe Reservoirs at the west and east ends of the city.

The York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment will:

- assess existing infrastructure and the environment;
- identify the problem and alternative solutions;
- determine needs for future growth;
- evaluate alternatives for routing, construction methods and mitigation measures; and
- develop a preferred alternative to meet the project objectives for both the sewer and feedermain.

The process

The York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Project will be conducted as a Schedule B project in accordance with the "Municipal Class Environmental Assessment" (Municipal Engineers Association, June 2000 as amended in 2007) which is an approved process under the Ontario Environmental Assessment Act. The Class Environmental Assessment process includes public and review agency consultation, an evaluation of alternatives, an assessment of potential environmental effects of the proposed projects, and identification of reasonable measures to mitigate any adverse impacts that may result.

How to participate

This fall, community members and interested parties are invited to attend the first of two open house events to review and discuss issues related to the York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain. Meeting dates and details will be advertized and posted in the meeting and event calendar at **guelph.ca/events.**

For more information

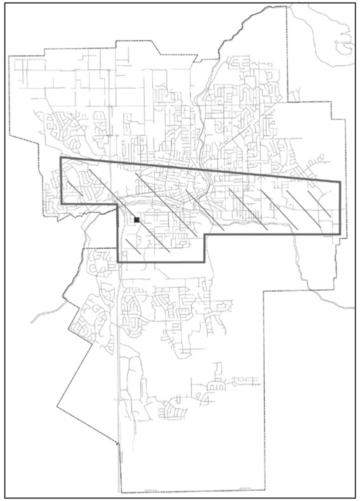
Please contact either one of our project team members if you have questions, comments or would like to be added to the project mailing list:

Colin Baker, P. Eng.
Environmental Engineer
City of Guelph
T **519-822-1260 x 2282**
E **colin.baker@guelph.ca**

James Witherspoon, P. Eng.
Project Manager
GENIVAR Consultants
T **519-827-1453**
E **jamie.witherspoon@genivar.com**

This notice first issued on September 2, 2010.

Study area



NOTICE OF COMMENCEMENT AND INVITATION TO PARTICIPATE

York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment

The projects

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The process

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James Witherspoon, P. Eng.
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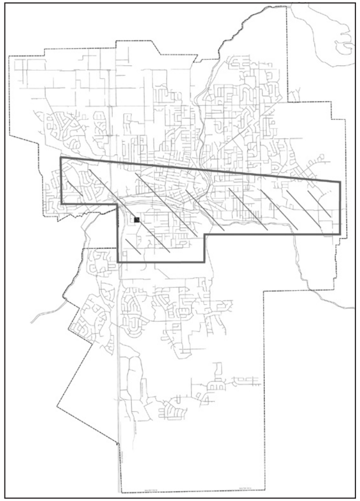
GENIVAR Consultants
T **519-827-1453**
E **jamie.witherspoon@genivar.com**

guelph.ca/stormwater



OPEN HOUSE NOTICE

York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment

The City of Guelph has initiated a Class Environmental Assessment study for improvements to the York Trunk Sanitary Sewer and a new drinking water feedermain for the Paisley and Clythe Reservoirs. The Guelph Water and Wastewater Servicing Master Plan (2009) identified the need for these improvements in order to service planned growth in the City.

Open House

October 6
6-8 p.m.
City Hall, 1 Carden St.
Meeting Room C

The open house will provide background information on the study and the various alternatives being considered. Representatives from the City and its consultant will be present to answer questions and discuss the next steps in the study.

About the study

The current York Trunk Sanitary Sewer extends from the former Guelph Reformatory Lands to the Wastewater Treatment Plant west of the Hanlon Expressway along the Eramosa and Speed Rivers. This sewer is reaching the end of its useful life and capacity due to a combination of planned population and employment growth in the City and reports of poor condition in sections. A solution is required to replace and/or rehabilitate this main trunk sewer.

The Paisley-Clythe Drinking Water Feedermain is a new watermain required to increase the reliability of the supply between the City's F.M. Woods Reservoir and Pumping Station and the Paisley and Clythe Reservoirs at the west and east ends of the City.

The York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment will:

- assess existing infrastructure and the environment
- identify the problem and alternative solutions
- determine needs for future growth
- evaluate alternatives for routing, construction methods and mitigation measures
- develop a preferred alternative to meet the project objectives for both the sewer and feedermain

The process

This study is being planned under Schedule B of the Municipal Class Environmental Assessment process (Municipal Engineers Association, June 2000 as amended in 2007) under Ontario's Environmental Assessment Act. The Class Environmental Assessment process includes public and review agency consultation, an evaluation of alternatives, an assessment of the potential environmental effects of the proposed improvements, and identification of reasonable measures to mitigate any adverse impacts that may result.

Provide your comments

You are encouraged to attend the open house and provide your comments. Those comments will be considered in finalizing the preferred solutions. Comments and information regarding this project will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become part of the public record.

Other opportunities for input

Opportunities for public input will continue throughout the Class Environmental Assessment process to seek community and stakeholder feedback. Future consultation opportunities will be publicized in this newspaper and posted on the City's website at **guelph.ca.**

For more information

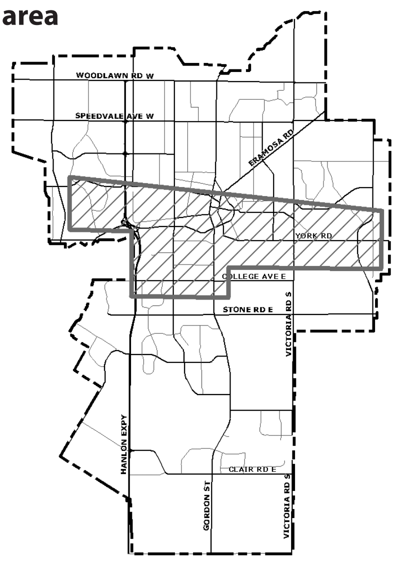
Please contact either one of the following project team members if you have any questions or comments, wish to obtain more information on the project, or if you would like to be added to the project mailing list.

Colin Baker, P. Eng.
Environmental Engineer
City of Guelph
1 Carden St.
Guelph, ON N1H 3A1
T **519-822-1260 x 2282**
E **colin.baker@guelph.ca**

James Witherspoon, P.Eng.
Project Manager
GENIVAR Consultants
1-367 Woodlawn Rd. W.
Guelph, ON N1H 7K9
T **519-827-1453**
E **jamie.witherspoon@genivar.com**

This notice first issued September 23, 2010

Study area



Appendix D

Public Information Centre #1 – Sign-In Sheet

CITY OF Guelph

Making a Difference

The City of Guelph

York Trunk Sewer & Paisley-Clythe Feedermain Municipal Class Environmental Assessment

Public Information Centre No. 1

October 6, 2010
6: 00 PM

SIGN-IN SHEET

Please Print Clearly

NAME, ORGANIZATION	ADDRESS	EMAIL ADDRESS	PHONE #	ADD TO MAILING LIST
James Etienne GRCA	400 Clyde Rd. Cambridge ON	jetienne@grandriver.ca	(519) 621-2761 x2298	YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO

Under the Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this matter and will be released, if requested, to any person.

Thank you for your participation in this study

Appendix E

Public Information Centre #1 - PowerPoint Presentation

The City of Guelph
www.guelph.ca

Welcome to Public Information Centre (PIC) No. 1 for the

York Trunk Sewer & Paisley-Clythe Feedermain Class Environmental Assessment

Open House

Please complete the sign-in sheet and review the display materials.
One of our representatives will be pleased to answer your questions and address any concerns.

Your input is much appreciated!

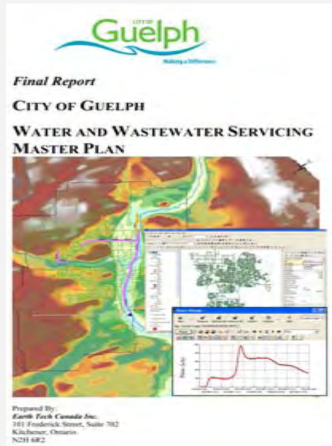
York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

Background

In 2009, the City of Guelph completed a Water and Wastewater Servicing Master Plan to identify a preferred water distribution and wastewater conveyance strategy to satisfy existing and future water use needs. Among the list of recommended projects, the York Trunk Sewer and the Paisley-Clythe Feedermain were identified by the City as projects set for implementation within the 2011-2016 timeframe.



The Need for New Infrastructure

The York Trunk Sewer

Inflow and infiltration studies and a visual inspection of the York Trunk Sewer have indicated that several sections of the sewer lack capacity and are in poor condition.

An expansion of the existing York Trunk Sewer will be required to convey sewage flows within the existing sewer's catchment area to the City's Wastewater Treatment Plant to accommodate planned population and employment growth.

Paisley-Clythe Feedermain

The Paisley-Clythe Feedermain was identified in the 2009 Water and Wastewater Servicing Master Plan as a priority project. It will be required to improve the east to west water transmission within the City and to eventually service future areas of growth.

Project Objectives

The City of Guelph has initiated the Class EA for the York Trunk Sewer and the Paisley-Clythe Feedermain to determine the preferred servicing alternatives for both pieces of infrastructure

The objectives of York Trunk Sewer and Paisley-Clythe Feedermain Class EA are to:

- Establish the York Trunk Sewer and the Paisley-Clythe Feedermain servicing requirements
- Establish the feasibility for establishing a future urban water reuse distribution system (purple pipe)
- Investigate the potential for energy capture from the City's sanitary sewer system
- Evaluate and document alternatives for infrastructure implementation to **mitigate their impact** on the natural, social, cultural, and economic environment
- Satisfy the requirements of the Municipal Engineers Association (**MEA) Class EA process**

Project Background & Objectives

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
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Class EA Planning Process

The Ontario Environmental Assessment Act, R.S.O., 1990 (the EA Act) requires that projects corresponding to a given class of undertakings (e.g. municipal road, transit, water and wastewater projects) follow an approved Class Environmental Assessment (Class EA) process. The Class EA planning process as documented in the MEA Municipal Class EA document (October 2000, amended in 2007) includes the following five phases:

PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
Problem or Opportunity	Alternative Solutions	Alternative Design Concepts for Preferred Solution	Environmental Study Report	Implementation

The water and wastewater infrastructure needs identified in the City's Master Plan fall within the Municipal Class EA process.

Class EA Schedules for this Study

Depending on their environmental impact, municipal projects are classified in the Municipal Class EA in terms of schedules:

- Schedule A or A+
- Schedule B
- Schedule C

The York Trunk Sewer & Paisley-Clythe Feedermain EA will be conducted as a Schedule B Class EA which requires completion of Phase 1 and 2 of the MEA Municipal Class EA process.

The Municipal Class EA Process

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October 6, 2010

York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
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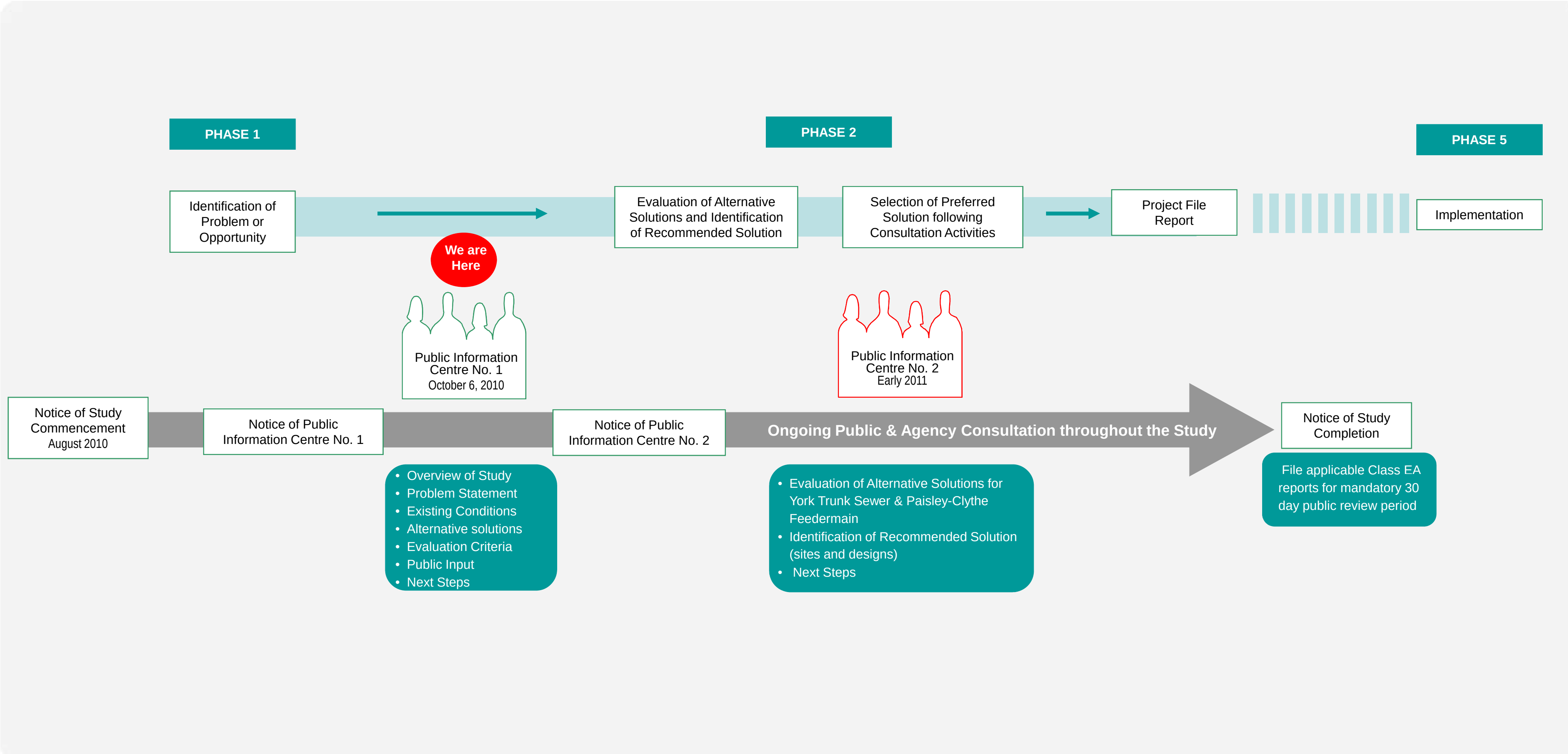

Project Overview

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October 6, 2010

York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
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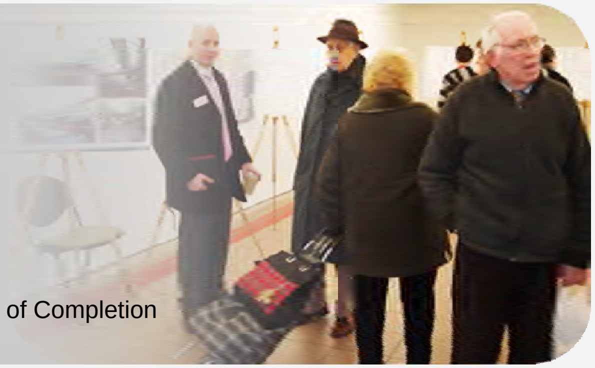
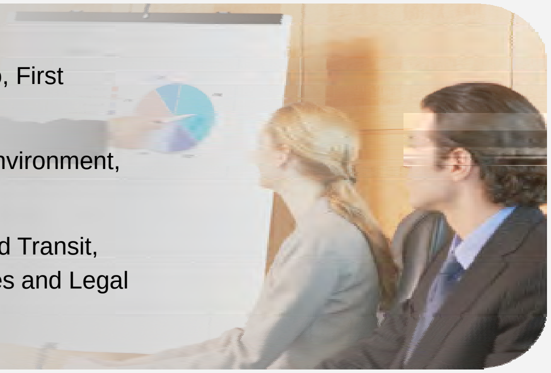
Public Consultation



- Two Public Information Centres will be held during this Class EA study to obtain public feedback.
- We encourage the public to make comments and provide input to this Class EA study.
- Stakeholders can get involved with this Class EA study in the following ways:
  - Add your name to our stakeholder contact list
  - Submit your written comments to the Project Team
  - Submit written comments to the Ministry of Environment and Project Team following issuance of the Notice of Completion

Additional Stakeholder Consultation



- Community organizations are being consulted through a parallel process to the Public Consultation, in addition to, First Nations, Aboriginal, and Métis groups.
- Review and Approval Agencies (Grand River Conservation Authority, Ministry of Transportation, and Ministry of Environment, and others) will be consulted, as needed, throughout the course of the Study's undertaking.
- An Internal Steering Committee (ISC), comprised of City staff from various departments, including: Operations and Transit, Planning, Engineering, and Environmental Services, Community Design and Development, and Human Resources and Legal Services has been formed and will be met with at key project milestones during the course of the Class EA Study.

Stakeholder Consultation

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October 6, 2010

York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

SOCIAL & CULTURAL ENVIRONMENT CONSIDERATIONS

- Proximity to Built-up Areas
- Traffic Impacts during Construction
- Known Archaeological Features
- Private Properties Affected
- Impact on Recreation Areas

NATURAL ENVIRONMENT CONSIDERATIONS

- Crossing Natural Features (rivers, wetlands, woodlots)
- Proximity to Natural Heritage Features/Vegetation
- Groundwater/Subsurface Conditions
- Surface Water (Quality/Quantity)
- Proximity to Valley Lands and Floodplains
- Watercourse Crossings and Fisheries

TECHNICAL CONSIDERATIONS

- Ability to Service Future Development
- Constructability and Site Access
- Soil / Ground Conditions
- Location and Impacts of other Utilities
- Road/Railway Crossings
- Site size & compatibility
- Ability to Connect with Existing Infrastructure
- Water Undercrossings
- Presence of Historical Landfill Site

ECONOMIC CONSIDERATIONS

- Capital Costs
- Operation and Maintenance (including energy) Costs
- Rehabilitation/Replacement Costs
- Land Acquisition Costs

Evaluation Criteria

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

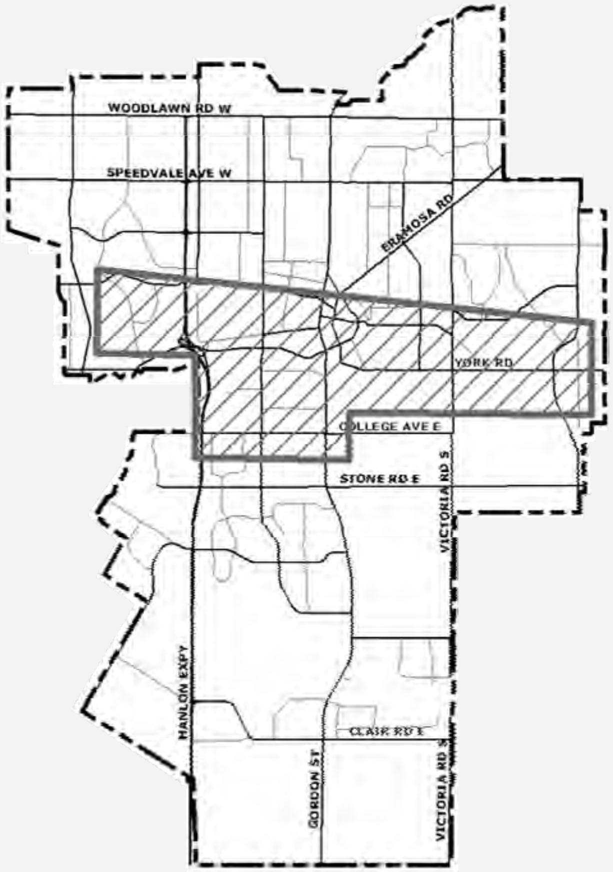
The City of Guelph
www.guelph.ca

Problem/Opportunity Statement

How to provide water and wastewater servicing to existing and future developments in Guelph while minimizing impacts on the natural, cultural, social, and agricultural features in the study area.

Study Area

The Study Area extends along a key area within Guelph from the existing Wastewater Treatment Plant, west of the Hanlon Expressway along the shoreline of the Speed River to east of the Royal City Jaycees Park near Watson Road



Study Area

Problem Definition and Service Area

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October 6, 2010

EXISTING YORK TRUNK SEWER
ALIGNMENT AND SERVICE AREA

CITY OF Guelph
Making a Difference

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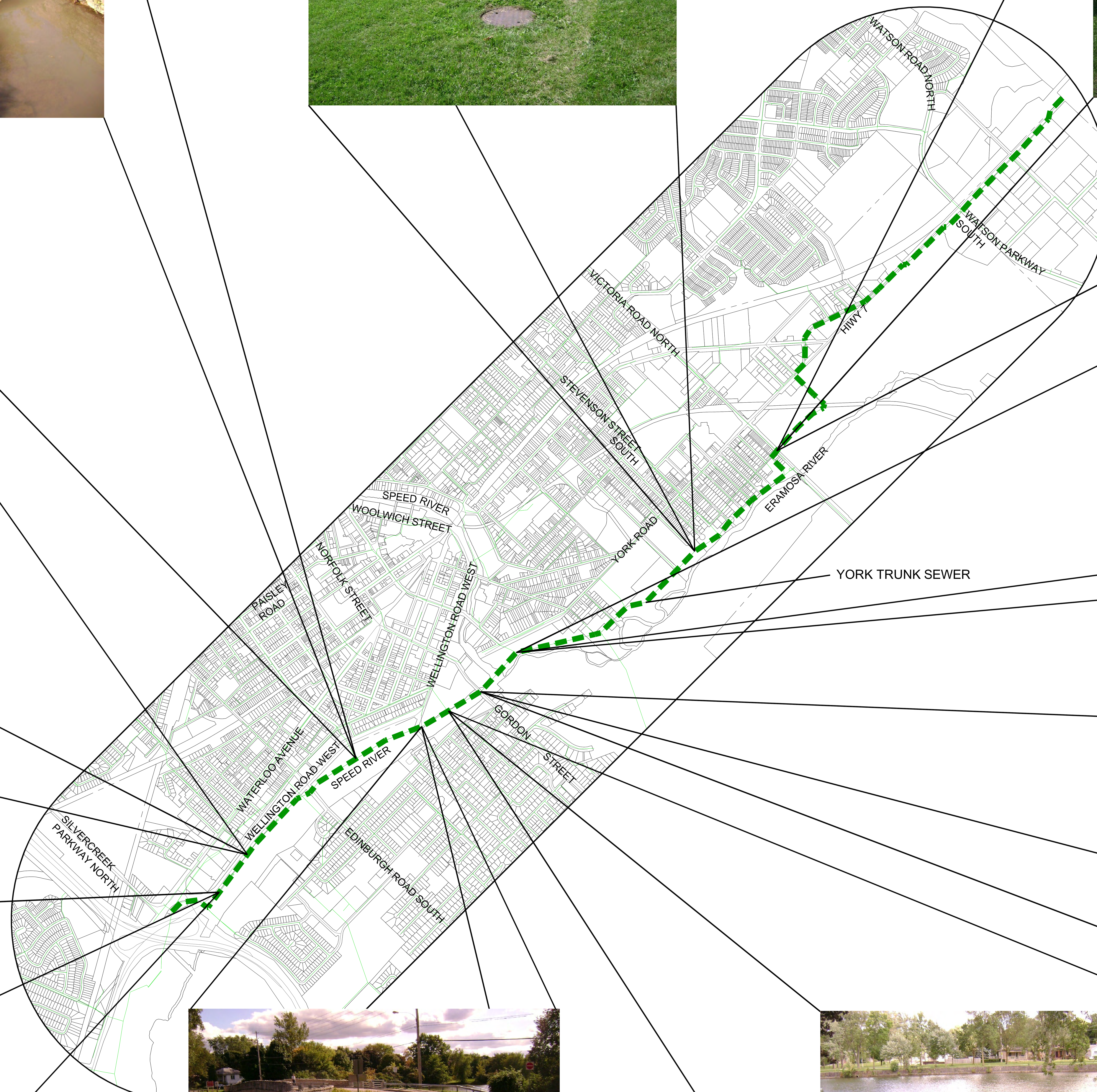
EXISTING YORK TRUNK SEWER CROSSING MUNICIPAL DRAIN IN SILVERCREEK PARK, BETWEEN EDINBURGH ROAD AND GORDON STREET

EXISTING YORK TRUNK SEWER ALIGNMENT LOCATED IN ERAMOSA RIVER PARK

INTERSECTION OF VICTORIA ROAD AND FLORENCE LANE LOOKING NORTH

EXISTING YORK TRUNK SEWER ALIGNMENT ADJACENT TO SOCCER FIELD LOCATED IN YORK ROAD PARK

EXISTING YORK TRUNK SEWER ALIGNMENT ADJACENT TO VOLLEYBALL COURTS IN SILVERCREEK PARK



EXISTING YORK TRUNK SEWER ALIGNMENT AT GORDON STREET UNDERCROSSING

YORK TRUNK SEWER CROSSING MUNICIPAL DRAIN ON SOUTH SIDE OF WELLINGTON ROAD

EXISTING YORK TRUNK SEWER ALIGNMENT AT MCCRAE BOULEVARD

EXISTING YORK TRUNK SEWER ALIGNMENT IN SILVERCREEK PARK LOOKING SOUTH TOWARDS WATER STREET

YORK TRUNK SEWER
- KEY FEATURES

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Do Nothing	• Maintain Existing Sanitary Trunk Sewer • Existing system does not provide for future growth and some pipes are deteriorating or undersized for current sanitary sewage flows.
Rehabilitation of Existing York Trunk Sewer	• Sections of the existing sewer which are adequately sized but in need of repair may be rehabilitated as opposed to requiring replacement. • Does not provide for an increase in capacity and may not meet current or future flow demands.
Twinning of Existing Sewer and Rehabilitation of Existing Sewer	• Sections of the existing sewer which are adequately sized but are deteriorating may be rehabilitated as opposed to requiring replacement • A new sewer may be installed alongside the existing sewer, where the sewer is undersized to accommodate future increases in capacity.
Partial Replacement of Existing Sewer and Twinning	• Sections of the existing sewer in poor condition may be replaced and resized as required. • Existing sections of the sewer in good condition, but undersized, can be twinned with a new sewer to provide capacity for current and future flow demands.
Other Opportunities	• Sizing of upgrades to the York Trunk Sewer to accommodate future flow from other Trunk Sewers (Speed/Arthur) and to alleviate flow pending upgrades within the sanitary distribution system. • Overflow interconnections with existing sewers to increase the capacity of the entire system. • Reduction in inflow and infiltration through pipe upgrades will reduce operational costs, increase lifespan of sewage treatment facility, and reduce the cost of future infrastructure. • Servicing Guelph Innovation District

Potential Alternatives & Opportunities – York Trunk Sewer

WATERMAIN AND TRUNK SEWER AREA OF STUDY

York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

Do Nothing	• Maintain existing water distribution system. • May not meet future demands and operational requirements
Provide New Water Feedermain to Connect Clythe Pumping Station to Paisley Pumping Station Reservoir	• Will provide improved east-west water transmission in Zone 1 of water distribution system. • Will provide a backup water supply if repairs are required at other points in the distribution system. • Will provide backup in the event of unexpected service interruptions. • Opportunity of cost savings by performing work in conjunction with upgrades to the York Sanitary Trunk Sewer.
Upgrade Existing Water Distribution Network	• Upgrade existing pipes to accommodate future growth and demand. • Can be performed in conjunction with road works upgrades to other services. • Does not provide effective system redundancy. • May not provide for future demand or operations requirements (pressure, etc.).

Potential Alternatives & Opportunities – Paisley-Clythe Feedermain

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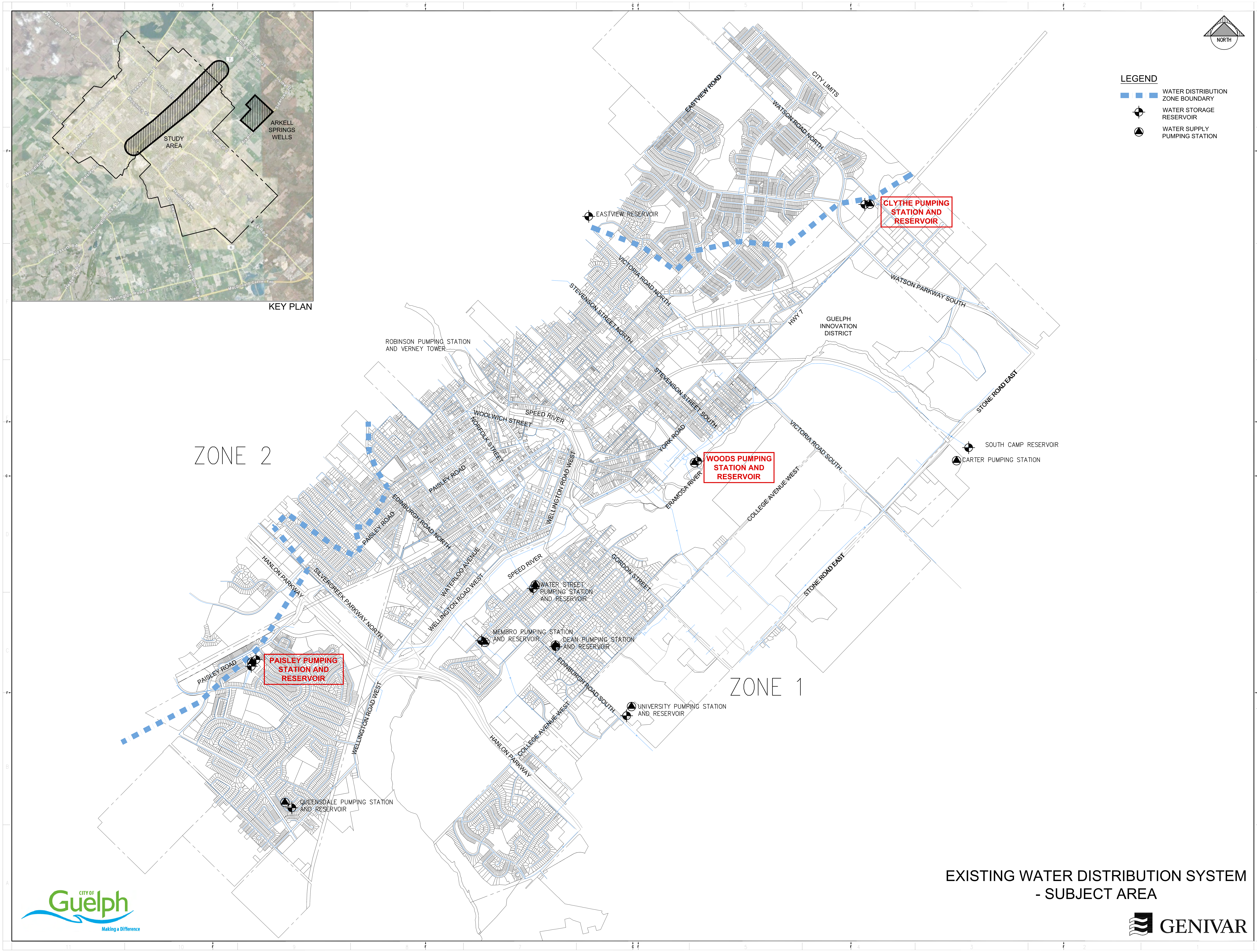

KEY PLAN
STUDY AREA
ARKELL SPRINGS WELLS
LEGEND
WATER DISTRIBUTION ZONE BOUNDARY
WATER STORAGE RESERVOIR
WATER SUPPLY PUMPING STATION
NORTH
ZONE 2
ZONE 1
CLYTHE PUMPING STATION AND RESERVOIR
EASTVIEW RESERVOIR
WOODS PUMPING STATION AND RESERVOIR
PAISLEY PUMPING STATION AND RESERVOIR
ROBINSON PUMPING STATION AND VERNEY TOWER
SOUTH CAMP RESERVOIR
CARTER PUMPING STATION
WATER STREET PUMPING STATION AND RESERVOIR
MEMBRO PUMPING STATION AND RESERVOIR
DEAN PUMPING STATION AND RESERVOIR
UNIVERSITY PUMPING STATION AND RESERVOIR
QUEENSDALE PUMPING STATION AND RESERVOIR
GUELPH INNOVATION DISTRICT
CITY LIMITS
EASTVIEW ROAD
WATSON ROAD NORTH
WATSON PARKWAY SOUTH
VICTORIA ROAD NORTH
VICTORIA ROAD SOUTH
STEVENSON STREET NORTH
STEVENSON STREET SOUTH
HWY 7
STONE ROAD EAST
YORK ROAD
ERAMOSA RIVER
COLLEGE AVENUE WEST
SPEED RIVER
WOOLWICH STREET
NORFOLK STREET
PAISLEY ROAD
EDINBURGH ROAD NORTH
EDINBURGH ROAD SOUTH
WELLINGTON ROAD WEST
WATERLOO AVENUE
GORDON STREET
HANLON PARKWAY
SILVERCREEK PARKWAY NORTH
EXISTING WATER DISTRIBUTION SYSTEM - SUBJECT AREA
City of Guelph
Making a Difference
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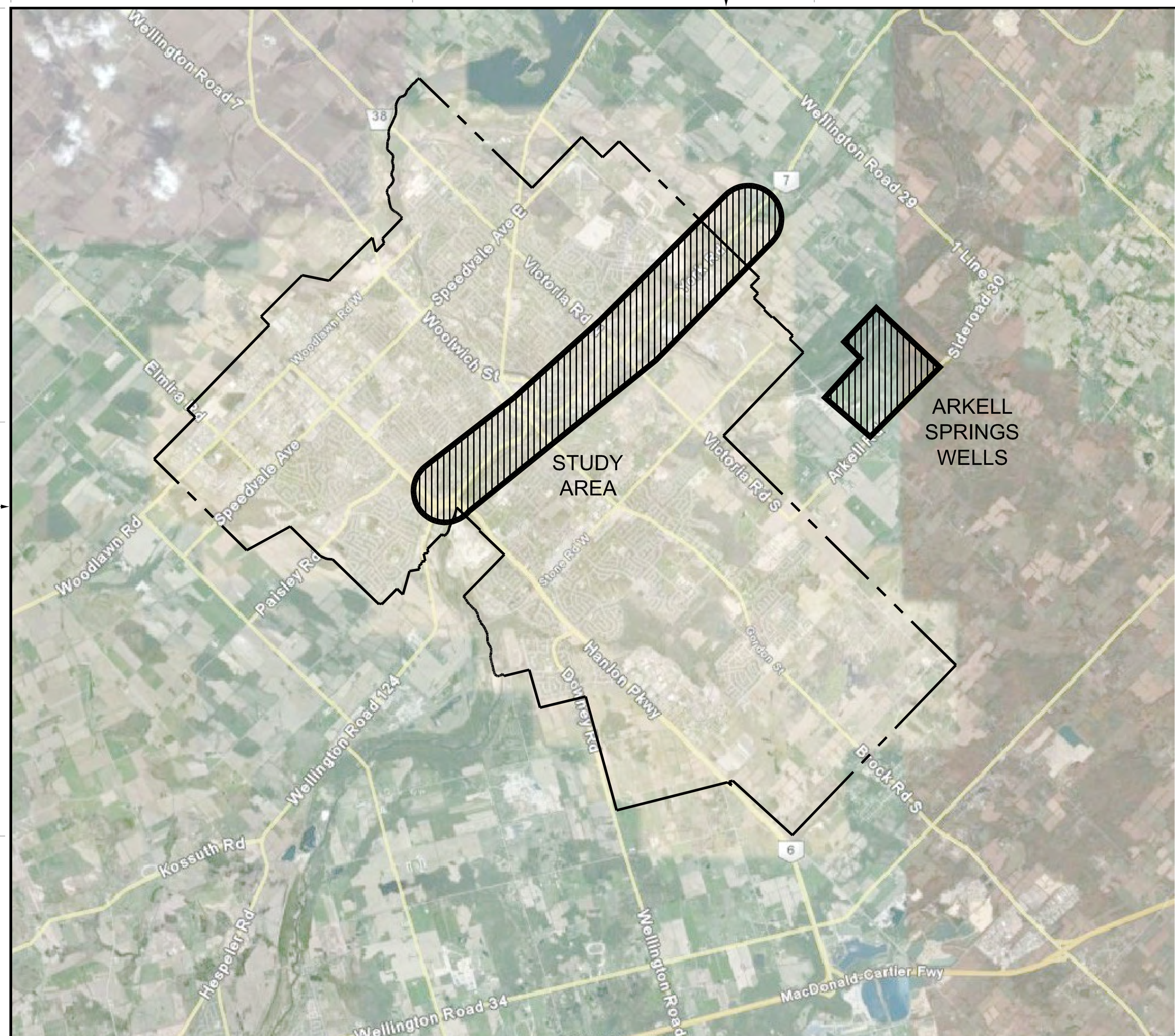
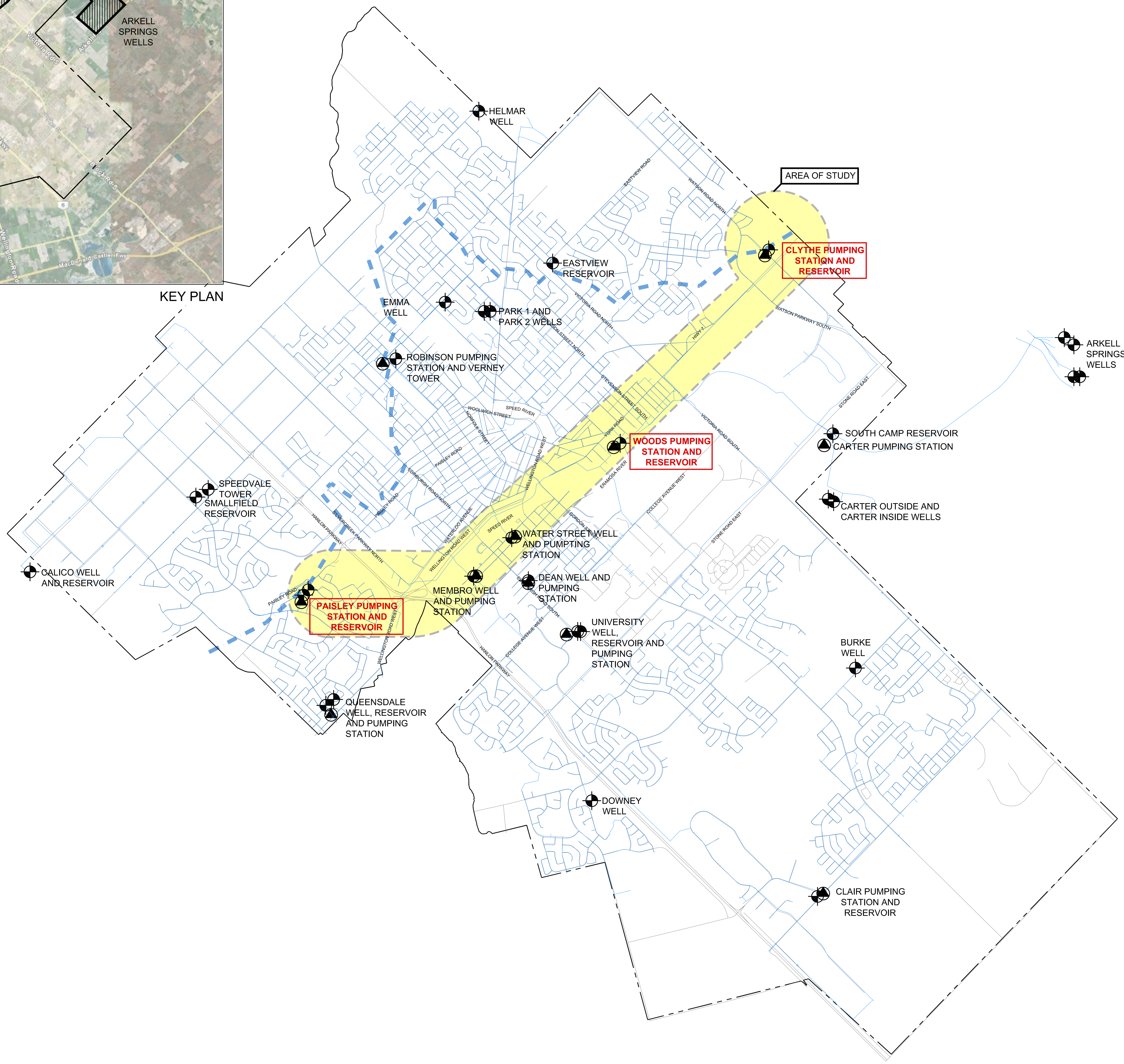


KEY PLAN



NORTH

LEGEND

- WATER STORAGE RESERVOIR, W ELL, OR TOWER
- WATER SUPPLY PUMPING STATION
- WATERMAIN
- ROAD
- CITY BOUNDARY
- WATER DISTRIBUTION ZONE BOUNDARY
- AREA OF STUDY

City of Guelph
Making a Difference

EXISTING WATER DISTRIBUTION SYSTEM FOR THE CITY OF GUELPH

GENIVAR

York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

Wastewater Reuse

The 2008 Wastewater Treatment Plant Master Plan identified the opportunity of wastewater reuse for non-potable uses (irrigation, industrial use) to reduce potable water demand. This system is known as the "Purple Pipe" system due to the colour used to identify the pipes in a wastewater treatment facility.

Impact on this Study

This project will include a review of the opportunities to reuse effluent within City Parks, Golf Courses, University and Industrial facilities within the project study area. The feasibility of the inclusion of this component of the preferred alternative will be assessed in terms of social, natural and economic environmental impacts.

Energy Capture

The 2008 Wastewater Treatment Plant Master Plan identified the potential opportunity to capture heat from the wastewater in the trunk sewers, using heat exchangers, which is consistent with the goals of the City's Community Energy Initiative. This innovative approach would be one of the first in North America.

Impact on this Study

This project will include a review of the feasibility of developing an energy capture system to collect heat from the wastewater. The energy could be used to heat portions of the wastewater treatment plant or other buildings. This will include evaluation of the seasonal temperature variation in the wastewater, opportunities for installation of the necessary equipment and the cost/benefit analysis.

Additional Issues – Wastewater Reuse & Energy Capture

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

Comment Sheets from Public Information Centre No.1 (due to Project Team by October 27)
Review and Incorporate comments received from Public and Review Agencies

Sewer and Feedermain Alignments
Undertake Evaluation of Alternative Solutions
Identification of Recommended Solution

Terrestrial and Archeological Assessment

Wastewater Reuse
Undertake Feasibility Evaluation
Identification of Recommended Solution

Energy Capture
Undertake Feasibility Evaluation
Identification of Recommended Solution

Public Information Centre No. 2 Early 2011

Development of Project File Notice of Completion – Spring 2011

Implementation
Construction – Summer 2012

Social Environment
Land Use
Construction Impacts
Cultural Heritage
Archaeology
Quality of Life – Health and Safety
Aesthetic
Property Requirement Impacts

Natural Environment
Water Quality – Surface Water and Groundwater
Environmentally Sensitive Areas (ESAs)
Areas of Natural and Scientific Interest (ANSIs)
Woodlots and Trees
Hedgerows
Wildlife (Species at Risk)
Flora and Fauna
Natural Heritage
Aquatic and Terrestrial Resources

Technical
Level of Service
Regulatory Requirements/Approvals
Difficulty of Construction
Reliability
Service Life Expectancy
Utilities
Operation and Maintenance

Cost
Capital Cost (Engineering, Land, and Construction)
Annual Operating and Maintenance Cost
Life Cycle Cost

Next Steps

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

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Environmental Engineer
City of Guelph
City Hall, 1 Carden Street
Guelph, ON N1H 3A1
Phone: 519-822-1260 ext. 2282
Fax: 519-837-5640
Email: colin.baker@guelph.ca

James Witherspoon, P.Eng., LEED AP
Project Manager
GENIVAR Consultants Limited Partnership
1-367 Woodlawn Road West
Guelph, ON N1H 7K9
Phone: 519-827-1453 ext. 221
Fax: 519-827-1483
Email: jamie.witherspoon@genivar.com

Project Team Contacts

GENIVAR

Appendix F

Notice of Public Information Centre #2

City of Guelph
Making a Difference

OPEN HOUSE NOTICE

York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment

The Study

The City of Guelph has initiated a Class Environmental Assessment study for improvements to the York Trunk Sanitary Sewer and a new drinking water feedermain for the Paisley and Clythe Reservoirs. The Guelph Water and Wastewater Servicing Master Plan (2009) identified the need for these improvements in order to service planned growth in the City.

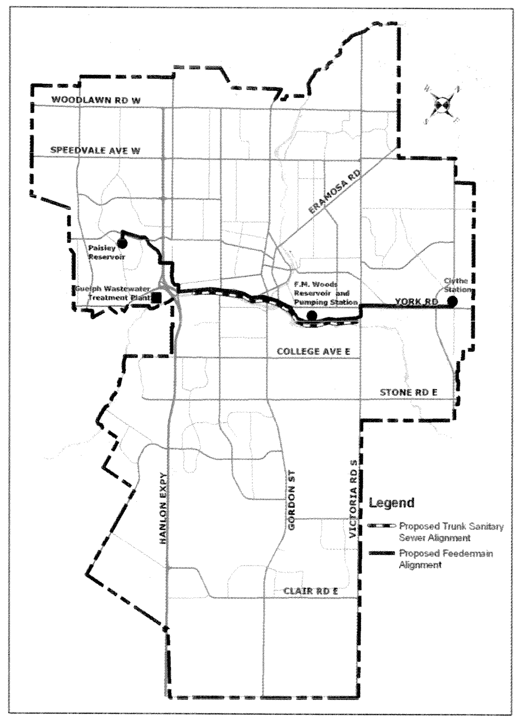
Second Public Open House

Wednesday, June 8
6 - 8 p.m.
Committee Room 112, City Hall, 1 Carden Street

The open house will provide background information on the study, evaluation of various alternatives, and the recommended sewer and feedermain alignments and mitigation measures. Representatives from the City and its consultant will be present to answer questions and discuss the next steps in the project.

About the study

The current York Trunk Sanitary Sewer extends from the former Guelph Reformatory Lands to the Wastewater Treatment Plant west of the Hanlon Expressway along the Eramosa and Speed Rivers.



Recommended Sewer and Feedermain Alignments

This sewer is reaching the end of its useful life and capacity due to a combination of planned population and employment growth in the City and reports of poor condition in sections. A solution is required to replace and/or rehabilitate critical sections of this main trunk sewer.

The Paisley-Clythe Drinking Water Feedermain is a new watermain required to increase the reliability of the supply between the City's F.M. Woods Reservoir and Pumping Station and the Paisley and Clythe Reservoirs located at the west and east ends of the city.

...

As part of the York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment, the City has:

- completed an assessment of existing infrastructure and the environment;
- identified the opportunity/problem and alternative solutions;
- determined the capacity requirements to service existing residents and future growth;
- completed an evaluation of alternatives for routing, construction methods and mitigation measures; and
- identified preliminary recommended alternatives to meet the project objectives for both the sewer and feedermain.

The Process

This study is being planned under Schedule B of the Municipal Class Environmental Assessment process (Municipal Engineers Association, October 2000 as amended in 2007) under Ontario's Environmental Assessment Act. The Class Environmental Assessment process includes public and review agency consultation, an evaluation of alternatives, an assessment of the potential environmental effects of the proposed improvements, and identification of reasonable measures to mitigate any adverse impacts that may result.

Provide your comments

You are encouraged to attend the open house and provide your comments. Those comments will be considered in finalizing the preferred solutions. Comments and information regarding this project will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become part of the public record.

For more information

Please contact either of the following project team members if you have any questions or comments, wish to obtain more information regarding the project, or if you would like to be added to the project mailing list:

City of Guelph
Colin Baker, P.Eng.
Environmental Engineer
1 Carden Street
Guelph ON N1H 3A1

T 519-822-1260 x 2282
F 519-822-6194
E colin.baker@guelph.ca

GENIVAR Consultants
James Witherspoon, P. Eng.
Project Engineer
1-367 Woodlawn Road West
Guelph ON N1H 7K9

T 519-827-1453
F 519-827-1483
E jamie.witherspoon@genivar.com

guelph.ca/yorktrunkea

This notice first issued May 26, 2011.

Appendix G

Public Information Centre #2 - Sign-In Sheet

CITY OF Guelph
Making a Difference

The City of Guelph

York Trunk Sewer & Paisley-Clythe Feedermain Municipal Class Environmental Assessment

Public Information Centre No. 2

June 8, 2011
6: 00 PM

SIGN-IN SHEET

Please Print Clearly

NAME, ORGANIZATION	ADDRESS	EMAIL ADDRESS	PHONE #	ADD TO MAILING LIST
Jackie Kay Burnside	292 Speedvale Ave, West	jkay@rjburnside.com	519-823-4995	YES / NO
Lori Pagnan & Fred Thamm	155 Ontario St	lpagnan@uoguelph.ca	519-823-9448	YES / NO
Kim Toole	5 Shirley Ave Guelph, ON			YES / NO
Bob Bell	86 ARTHUR			YES / NO
Hugh Whiteley	226 Exhibition St Guelph ON N1H4R5	hwhitele@uoguelph.ca	519 824 9345	YES / NO

Under the Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this matter and will be released, if requested, to any person.

Thank you for your participation in this study

CITY OF
Guelph
Making a Difference

The City of Guelph

York Trunk Sewer & Paisley-Clythe Feedermain
Municipal Class Environmental Assessment

Public Information Centre No. 2

June 8, 2011
6: 00 PM

SIGN-IN SHEET

Please Print Clearly

NAME, ORGANIZATION	ADDRESS	EMAIL ADDRESS	PHONE #	ADD TO MAILING LIST
Brent Tegler North-South Environmental Inc.	35 Crawford Cres Unit 5 Box 518, Campbellville ON L0P 1B0	btegler@nsenvironmental.com	905-854-1112	YES / NO
				YES / NO
				YES / NO
				YES / NO
				YES / NO

Under the Freedom of Information and Protection of Privacy Act and the Environmental Assessment Act, unless otherwise stated in the submission, any personal information such as name, address, telephone number and property location included in a submission will become part of the public record files for this matter and will be released, if requested, to any person.

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Appendix G

Public Information Centre #2 - Sign-In Sheet

CITY OF Guelph
Making a Difference

The City of Guelph

York Trunk Sewer & Paisley-Clythe Feedermain Municipal Class Environmental Assessment

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SIGN-IN SHEET

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NAME, ORGANIZATION	ADDRESS	EMAIL ADDRESS	PHONE #	ADD TO MAILING LIST
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Lori Pagnan & Fred Thomson	155 Ontario St	lpagnan@uoguelph.ca	519-823-9448	YES / NO
Kim Toole	5 Shirley Ave Guelph, ON			YES / NO
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Thank you for your participation in this study

CITY OF Guelph
Making a Difference

The City of Guelph

York Trunk Sewer & Paisley-Clythe Feedermain Municipal Class Environmental Assessment

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June 8, 2011
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Brent Tegler North-South Environmental Inc.	35 Crawford Cres Unit 5 Box 518, Campbellville ON L0P 1B0	btegler@nsenvironmental.com	905-854-1112	YES / NO
				YES / NO
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				YES / NO
				YES / NO

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Thank you for your participation in this study

Appendix H

Public Information Centre #2 - Completed Surveys

Bob Bell
86 Arthur St. N
Guelph.

COMMENT SHEET – PIC No. 2

CITY OF Guelph

Making a Difference

York Trunk Sewer & Paisley-Clythe Feedermain Municipal Class Environmental Assessment

The City of Guelph is interested in hearing the community's comments, questions, concerns and suggestions regarding the York Trunk Sewer & Paisley-Clythe Feedermain Class Environmental Assessment. Please take a few minutes to complete this brief comment sheet. All comments will be carefully considered in the Environmental Assessment Process.

1. Do you have any comments related to the **existing environment and key features** in this study area?

2. Do you have any comments, concerns, questions or suggestions regarding the **Environmental Assessment Process or the overall approach** to the Study?

3. Do you have any comments, concerns, questions or suggestions regarding the preferred solutions presented (e.g. water and/or sewer alignments)?

4. Do you have any comments, concerns, questions or suggestions regarding the evaluation criteria for the projects?

5. What do you see as the project features of highest interest for the proposed project from the perspective of your organization or as a resident of the area?

6. Additional comments related to the project.

7. Did you have the opportunity to ask questions, and provide your comments and concerns to the project team? YES / NO

If not, please provide comments as to what issues you would like to further discuss with the project team

____

9. Were you able to gain a better understanding of the Study? YES / NO

If not, please provide comments as to what elements of the Study are unclear to you.

____

10. Please provide any other comments regarding the Public Information Centre

Please consider pedestrian underpass at the junction with Edinburgh to Eastview & Sanitary

8. How would you describe the nature of your interest in this study?

______ Member of the General Public (including residents and landowners)
______ Member of an Interest Group (Please specify: ____________)
______ Consultant
______ Agency Representative (Please specify: ____________)
______ Other (Please specify: ____________)

Contact Details

Name: Effluent reuse is important and
Address: the economics of a purple pipe to the
Phone Number: golf course should be carefully
Email: examined.

NOTE: Personal information requested on this form is collected in accordance with the Freedom of Information and Privacy Act. All comments will become part of the public record. If you do not wish to have personal information (Name, Address, Telephone, Email) on this comment form in the final report, please check the box below:

( ) Please withhold personal information

Please return this completed Comment Sheet to the project team at the Registration Table or you can fax, email or mail it by June 27th, 2011 to one of the following project contacts:

Colin Baker, P. Eng.
Environmental Engineer
The City of Guelph
City Hall, 1 Carden Street
Guelph, ON N1H 3A1
Phone: 519-822-1260 ext. 2282
Fax:519-837-5640
Email: colin.baker@guelph.ca

James Witherspoon, P.Eng., LEED AP
Project Manager
GENIVAR Inc.
1-367 Woodlawn Road West
Guelph, ON N1H 7K9
Phone: 519-827-1453 ext. 221
Fax: 519-827-1483
Email: jamie.witherspoon@genivar.com

Please consider a pedestrian underpass at the GJR junction to facilitate the east side trail.

CITY OF Guelph
Making a Difference

York Trunk Sewer & Paisley-Clythe Feedermain Municipal Class Environmental Assessment

The City of Guelph is interested in hearing the community's comments, questions, concerns and suggestions regarding the York Trunk Sewer & Paisley-Clythe Feedermain Class Environmental Assessment. Please take a few minutes to complete this brief comment sheet. All comments will be carefully considered in the Environmental Assessment Process.

1. Do you have any comments related to the **existing environment and key features** in this study area?
   We have a particular interest in the area of the proposed alignment along the southern boundary of the property located at 40 Wellington Street

2. Do you have any comments, concerns, questions or suggestions regarding the **Environmental Assessment Process or the overall approach** to the Study?
   no

3. Do you have any comments, concerns, questions or suggestions regarding the preferred solutions presented (e.g. water and/or sewer alignments)?
   We would like to know the impact of construction in same area noted above, where development is being proposed – see attached concept plan

4. Do you have any comments, concerns, questions or suggestions regarding the evaluation criteria for the projects?
   no

5. What do you see as the project features of highest interest for the proposed project from the perspective of your organization or as a resident of the area?
   see comments above.

6. Additional comments related to the project.

7. Did you have the opportunity to ask questions, and provide your comments and concerns to the project team? YES / NO

If not, please provide comments as to what issues you would like to further discuss with the project team: Please have your biologist contact me to provide a better understanding of what environmental impacts are likely to occur at 40 Wellington St.

9. Were you able to gain a better understanding of the Study? YES / NO

If not, please provide comments as to what elements of the Study are unclear to you.

10. Please provide any other comments regarding the Public Information Centre

8. How would you describe the nature of your interest in this study?

______ Member of the General Public (including residents and landowners)
______ Member of an Interest Group (Please specify: ______)
X Consultant
______ Agency Representative (Please specify: ______)
X Other (Please specify: Property abutting proposed route)

Contact Details

Name: Brent Tegler
Address: 35 Crawford Crescent Unit B45 P.O. Box 518, Campbellville ON L0P 1B0
Phone Number: 905-854-1112
Email: btegler@nsenvironmental.com

NOTE: Personal information requested on this form is collected in accordance with the Freedom of Information and Privacy Act. All comments will become part of the public record. If you do not wish to have personal information (Name, Address, Telephone, Email) on this comment form in the final report, please check the box below:

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Guelph, ON N1H 7K9
Phone: 519-827-1453 ext. 221
Fax: 519-827-1483
Email: jamie.witherspoon@genivar.com

MSAi

MICHAEL SPAZIANI ARCHITECT INC
6 Helene Street N, Suite 100
Port Credit, Mississauga ON L5G 3B2
T 905 891 0691 F 905 891 0514

Gordon at Wellington Retail Centre Development Concept

Belmont Equity Partners

Site Context

June 3, 2011

Appendix I

Public Information Centre #2 - PowerPoint Presentation

Welcome to Public Information Centre (PIC) No. 2 for the

York Trunk Sewer & Paisley-Clythe Feedermain Class Environmental Assessment

Open House

Please complete the sign-in sheet and review the display materials.
One of our representatives will be pleased to answer your questions and address any concerns.

Contact Information

Colin Baker, P. Eng.
Environmental Engineer
City of Guelph
City Hall, 1 Carden Street
Guelph, ON N1H 3A1
Phone: 519-822-1260 ext. 2282
Fax: 519-837-5640
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Guelph, ON N1H 7K9
Phone: 519-827-1453 ext. 221
Fax: 519-827-1483
Email: jamie.witherspoon@genivar.com

Your input is much appreciated!

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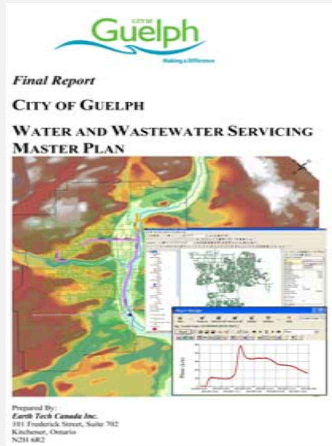
York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

Background

The City of Guelph has initiated a Class Environmental Assessment study for improvements to the York Trunk Sanitary Sewer and a new drinking water feedermain for the Paisley and Clythe Reservoirs. The Guelph Water and Wastewater Servicing Master Plan (2009) identified the need for these improvements in order to service planned growth in the City.


Final Report
CITY OF GUELPH
WATER AND WASTEWATER SERVICING MASTER PLAN

The Need for New Infrastructure

The York Trunk Sewer

The current York Trunk Sanitary Sewer extends from the former Guelph Reformatory Lands to the Wastewater Treatment Plant west of the Hanlon Expressway along the Eramosa and Speed Rivers.

This sewer is reaching the end of its useful life and capacity due to a combination of planned population and employment growth in the City and reports of poor condition in sections. A solution is required to replace and/or rehabilitate critical sections of this main trunk sewer.

Paisley-Clythe Feedermain

The Paisley-Clythe Drinking Water Feedermain is a new watermain required to increase the reliability of the supply between the City's F.M. Woods Reservoir and Pumping Station and the Paisley and Clythe Reservoirs located at the west and east ends of the city.

Project Objectives

The City of Guelph has initiated the Class Environmental Assessment (EA) for the York Trunk Sewer and the Paisley-Clythe Feedermain to determine the preferred servicing alternatives and alignments for both pieces of infrastructure.

The objectives of York Trunk Sewer and Paisley-Clythe Feedermain Class EA are to:

- Establish the Servicing Requirements of the York Trunk Sanitary Sewer
- Confirm the Capacity of the Existing Sanitary Sewer Sections
- Identify Trunk Sanitary Sewer Servicing Alternatives
- Establish the Servicing Requirements of the Paisley-Clythe Feedermain
- Identify Feedermain Servicing Alternatives
- Evaluate the Impacts of each Trunk Sanitary and Feedermain Alternative and Select Preferred Alternatives
- Investigate the Feasibility for Implementing a Treated Wastewater Effluent Reuse Program, also known as a "Purple Pipe" System, within the East-West Study Area
- Investigate the Feasibility for Implementing an Energy Capture System to Use Waste Heat from the Sanitary System

Project Background & Objectives

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

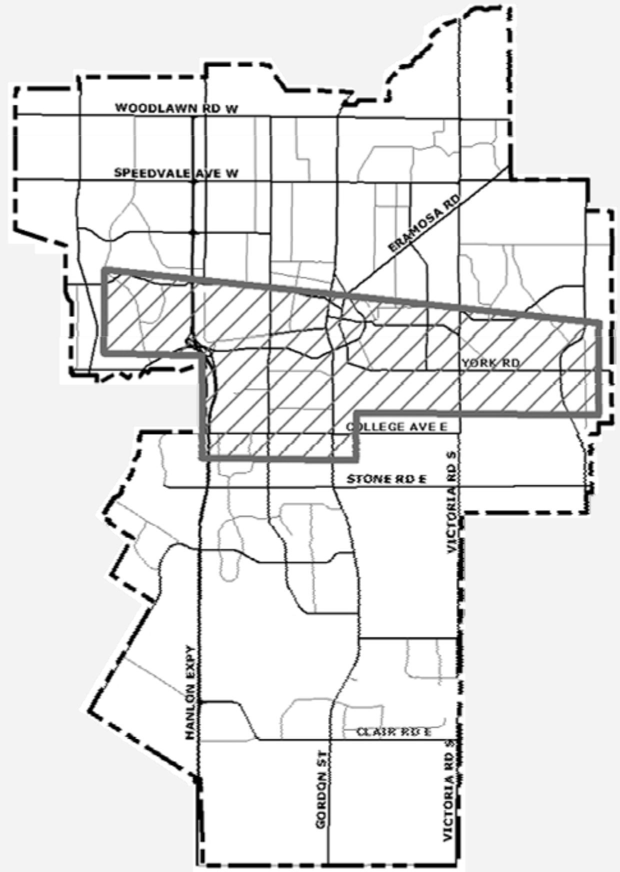
Problem/Opportunity Statement

York Trunk Sanitary Sewer – How to optimize available capacity for the wastewater servicing of existing and future developments in Guelph while minimizing the impacts on the natural, cultural, social and agricultural features in the study area.

Paisley-Clythe Feedermain – How to provide a security of supply to Zone 1 water distribution and to service existing and future developments in Guelph while minimizing the impacts on the natural, cultural, social and agricultural features in the study area.

Study Area

The Study Area extends along a key area within Guelph from the existing Wastewater Treatment Plant, west of the Hanlon Expressway along the shoreline of the Speed River to east of the Royal City Jaycees Park near Watson Road



Study Area

Problem Definition and Service Area

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

Class EA Planning Process

The Ontario Environmental Assessment Act, R.S.O., 1990 (the EA Act) requires that projects corresponding to a given class of undertakings (e.g. municipal road, transit, water and wastewater projects) follow an approved Class Environmental Assessment (Class EA) process. The Class EA planning process as documented in the MEA Municipal Class EA document (October 2000, amended in 2007) includes the following five phases:

PHASE 1	PHASE 2	PHASE 3	PHASE 4	PHASE 5
Problem or Opportunity	Alternative Solutions	Alternative Design Concepts for Preferred Solution	Environmental Study Report	Implementation

The water and wastewater infrastructure needs identified in the City's Master Plan fall within the Municipal Class EA process.

Class EA Schedules for this Study

Depending on their environmental impact, municipal projects are classified in the Municipal Class EA in terms of schedules:

- Schedule A or A+
- Schedule B
- Schedule C

The York Trunk Sewer & Paisley-Clythe Feedermain Class EA is being conducted as a Schedule B Class EA which requires completion of Phase 1 and 2 of the MEA Municipal Class EA process.

What Does a Schedule B Project Mean?

- There is the potential for some adverse environmental (natural, economic, social) effects.
- A Screening process is required with contact of public and relevant review agencies to make them aware of the project and ensure that any concerns are addressed.
- Following the completion of the screening process and alternative evaluation, a 30 day public review period will be provided for any comments and concerns to be included in the environmental assessment.
- After the 30 day review period the project file will be developed and a Notice of Completion issued.
- Subsequent to the Notice of Completion, the City can move to detailed design and study implementation

The Municipal Class EA Process

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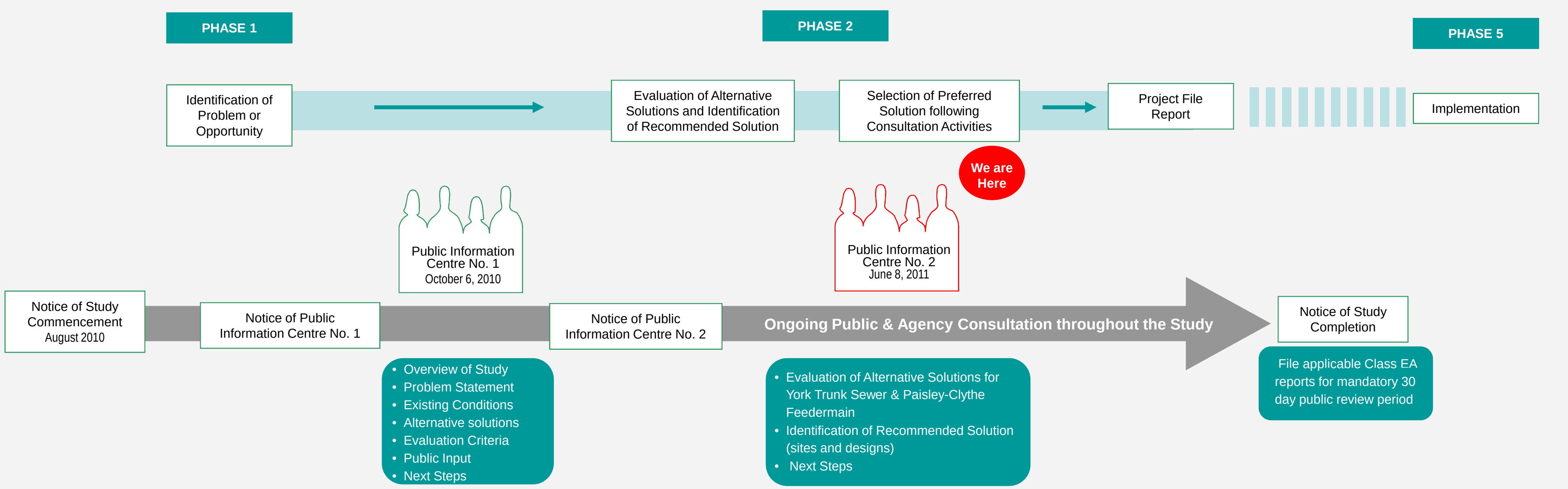
York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca



Project Overview

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

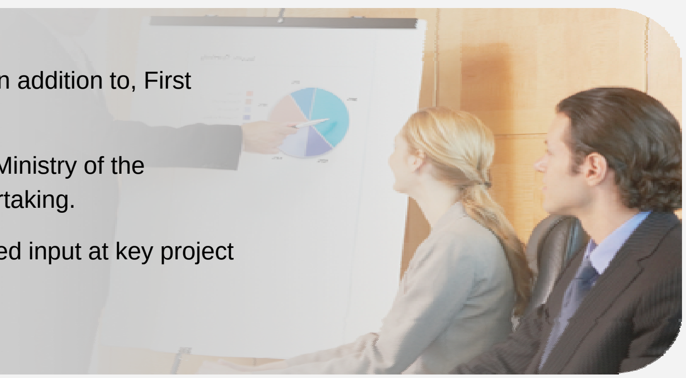
The City of Guelph
www.guelph.ca

Public Consultation

- Two Public Information Centres have been held during this Class EA study to obtain public feedback.
- We encourage the public to make comments and provide input to this Class EA study.
- Stakeholders can get involved with this Class EA study in the following ways:
  - Add your name to our project contact list
  - Submit your written comments to the Project Team

Additional Stakeholder Consultation

- Community organizations are being consulted through a parallel process to the Public Consultation, in addition to, First Nations, Aboriginal, and Métis groups.
- Review and Approval Agencies (Grand River Conservation Authority, Ministry of Transportation, and Ministry of the Environment, and others) are being consulted, as needed, throughout the course of the study's undertaking.
- An Internal Steering Committee (ISC), comprised of City staff from various departments, have provided input at key project milestones during the course of the Class EA Study.



Consultation

GENIVAR

York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
www.guelph.ca

SOCIAL & CULTURAL ENVIRONMENT CONSIDERATIONS

- Impacts on Local Businesses
- Proximity to Built-up Areas
- Traffic Impacts during Construction
- Known Archaeological Features
- Private Properties Affected
- Impact on Recreation Areas

NATURAL ENVIRONMENT CONSIDERATIONS

- Crossing Natural Features (rivers, wetlands, woodlots)
- Proximity to Natural Heritage Features/Vegetation
- Groundwater/Subsurface Conditions
- Surface Water (Quality/Quantity)
- Proximity to Valley Lands and Floodplains
- Watercourse Crossings and Fisheries

TECHNICAL CONSIDERATIONS

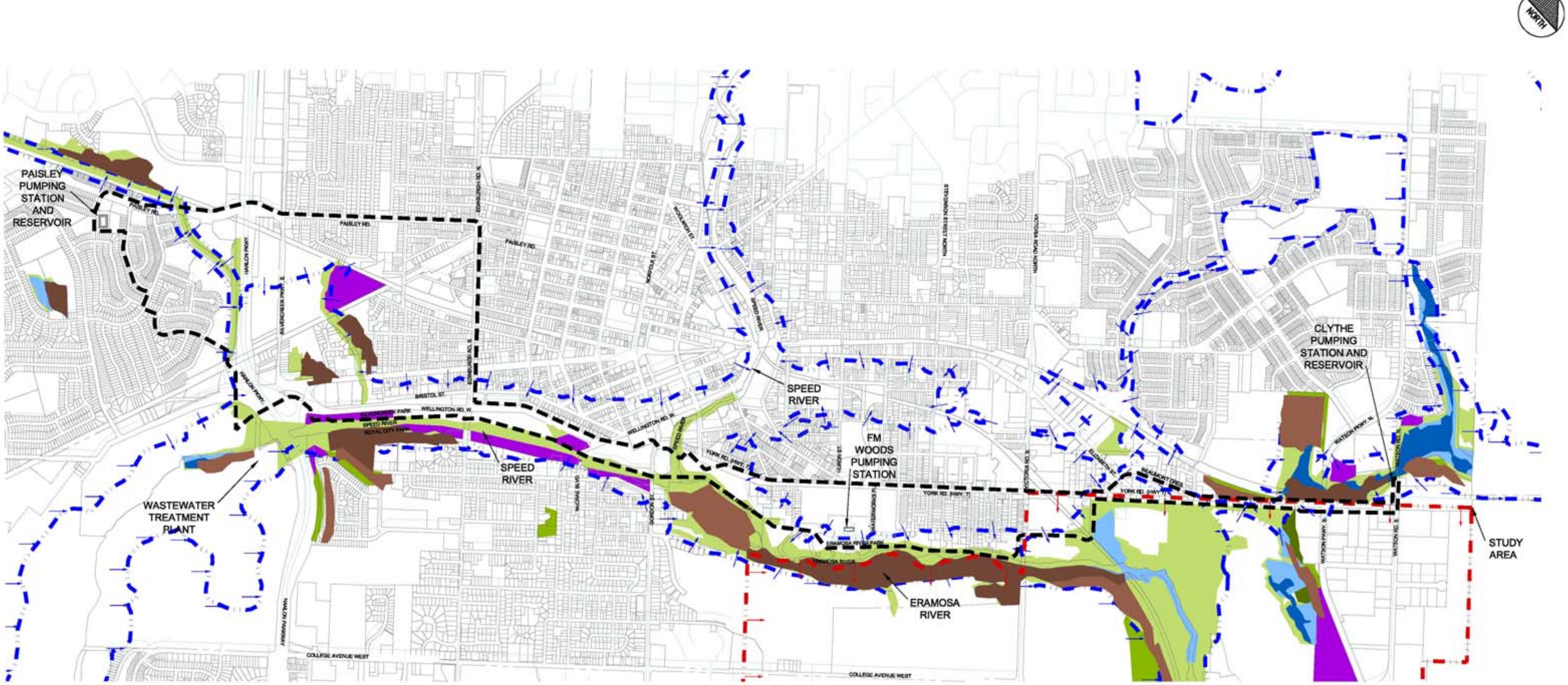
- Ability to Service Future Development
- Constructability and Site Access
- Soil / Ground Conditions
- Location and Impacts of other Utilities
- Road/Railway Crossings
- Site Size & Compatibility
- Ability to Connect with Existing Infrastructure
- Speed River/Creek Crossings
- Presence of Historical Landfill Site
- Coordinate with other Projects/Works

ECONOMIC CONSIDERATIONS

- Capital Costs
- Operation and Maintenance (including energy) Costs
- Rehabilitation/Replacement Costs
- Land Acquisition Costs

Evaluation Criteria

GENIVAR



LEGEND

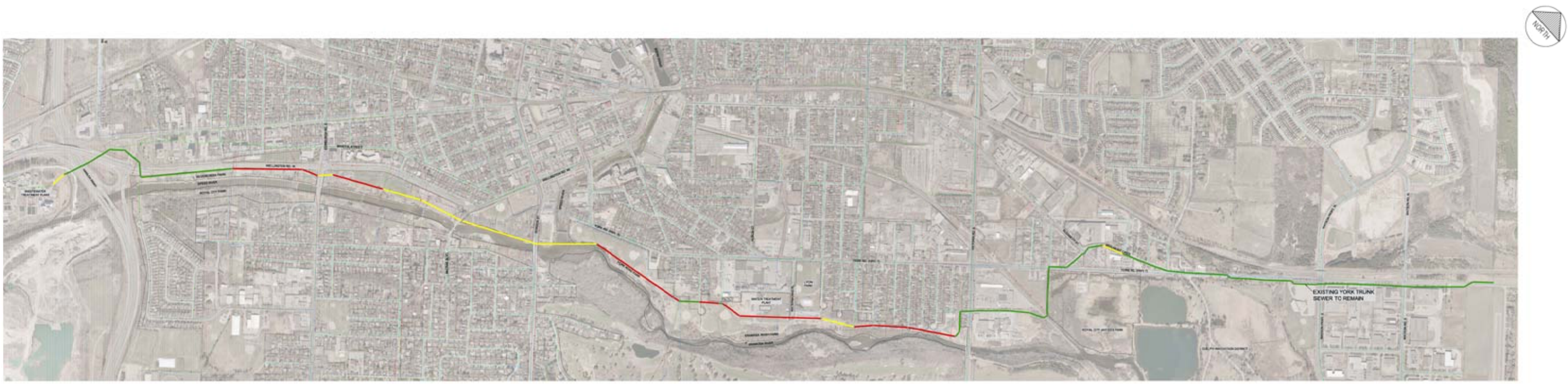
	STUDY AREA	NATURAL HERITAGE SYSTEMS		SIGNIFICANT WETLANDS		SIGNIFICANT WOODLANDS	
	ARKELL SPRINGS WATER RESOURCE PROTECTION AREA		SIGNIFICANT NATURAL AREAS		ONTARIO MINISTRY OF NATURAL RESOURCES DEFINED		SIGNIFICANT WOODLANDS
	FLOOD PLAIN		NATURAL AREAS		CITY OF GUEPLH DEFINED		CULTURAL WOODLANDS
			ECOLOGICAL LINKAGES				
			RESTORATION AREAS				

CITY OF Guelph
Making a Difference

NATURAL HERITAGE FEATURES

SCALE: 1:10,000

GENIVAR



LEGEND

- SEWER WITH ADEQUATE CAPACITY
- SEWER WITH FULL CAPACITY (OVER 80%)
- SEWER WITH SURCHARGED (ABOVE 100% CAPACITY)

Guelph

YORK TRUNK SEWER
CLASS ENVIRONMENTAL ASSESSMENT
EXISTING CAPACITY CONSTRAINTS

SCALE: 1:2500

GENIVAR

Do Nothing	• Maintain Existing Sanitary Trunk Sewer • Existing system does not provide for future growth and some pipes are deteriorating or undersized for current sanitary sewage flows.
Rehabilitation of Existing York Trunk Sewer	• Sections of the existing sewer which are adequately sized but in need of repair may be rehabilitated as opposed to requiring replacement. • Does not provide for an increase in capacity and may not meet current or future flow demands. • Cannot be easily performed under current flow conditions.
Twinning of Existing Sewer and Rehabilitation of Existing Sewer	• Sections of the existing sewer which are adequately sized but are deteriorating may be rehabilitated as opposed to requiring replacement • A new sewer may be installed alongside the existing sewer, where the sewer is undersized to accommodate future increases in capacity.
Partial Replacement of Existing Sewer and Twinning	• Sections of the existing sewer in poor condition may be replaced and resized as required. • Existing sections of the sewer in good condition, but undersized, can be twinned with a new sewer to provide capacity for current and future flow demands.
Other Opportunities	• Sizing of upgrades to the York Trunk Sewer to accommodate future flow from other Trunk Sewers (Speed/Arthur) and to alleviate flow pending upgrades within the sanitary distribution system. • Overflow interconnections with existing sewers to increase the capacity of the entire system. • Reduction in inflow and infiltration through pipe upgrades will reduce operational costs, increase lifespan of sewage treatment facility, and reduce the cost of future infrastructure. • Servicing to the Guelph Innovation District

Potential Alternatives & Opportunities – York Trunk Sewer

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

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Evaluation Criteria	Existing Alignment – Do Nothing	Rehabilitation of Existing York Trunk Sewer	Twinning of Existing Sewer and Rehabilitation of Existing Sewer	Partial Replacement of Existing Sewer and Twinning
Natural Environment Overall Rating	• Potential Impact to Natural Environment in the Event of Sewer Surcharge due to Structural Failure in Addition to Impacts Resulting from Exfiltration (Groundwater Contamination)	• Potential Impacts to Natural Environment in The Event of Sewer Surcharge (Overflow)	• Sanitary Surcharging (Overflow) Mitigated • Sanitary Sewer Crossing of Speed River would be Required	• Sanitary Surcharging (Overflow) Mitigated • Sanitary Sewer Crossing of Speed River would be Required
Social and Cultural Overall Rating	• Risk Of Damage to Private Properties Adjacent to the York Trunk in the Event of Surcharging	• Risk of Damage to Private Properties in the Event of Surcharging • Some Direct Impact on Public Facilities during Construction	• Risk of Damage to Properties can be Readily Mitigated • Impact on Public use if Sewer Route is through Parkland	• Risk of Damage to Properties can be Readily Mitigated • Public use of Parkland Impacted during Construction • Opportunity to Realign Sewer in Area of Woods Pumping Station To Allow for Plant Expansion
Technical Overall Rating	• No Additional Capacity for Sewer System Expansion within service area • Existing Sewer Due to Age Likely in Poor Condition in Some Locations	• No Additional Capacity for Sewer System Upgrades • Limited Rehabilitation Possible Due to Level of Flow in Sewer Pipes	• Provides Additional Capacity for Sewer System Expansion • Opportunity to Relieve Flow in Speed Trunk Sewer • Ease of Installation by Open Cut Construction • Allows for Future Rehabilitation of Existing Sewer to Gain Additional Capacity	• Provides Additional Capacity for Sewer System Expansion • Opportunity to Relieve Flow in Speed Trunk Sewer • Ease of Installation by Open Cut Construction • Allows for Rehabilitation of Existing Sewer to Gain Additional Capacity
Economic Overall Rating	• No Immediate Capital Costs • Potential for Future Costs Associated with Emergency Repairs • Does Not Permit Population Growth • Cost: est. $0	• Uncertain Costs for Rehabilitation • Does Not Permit Population Growth due to Inaccessibility • Cost: est. $3.6M	• High Initial Capital Cost • Allows for Growth for beyond 2041 • Cost: est. $18.5M	• High Initial Capital Cost • Allows for Growth beyond 2041 • Cost: est. $14.9M
OVERALL PREFERENCE RATING	• Does not Solve Identified Problem	• Does not Solve Identified Problem	• Does Provide a Solution to the Problem	• Does Provide a Solution to the Problem

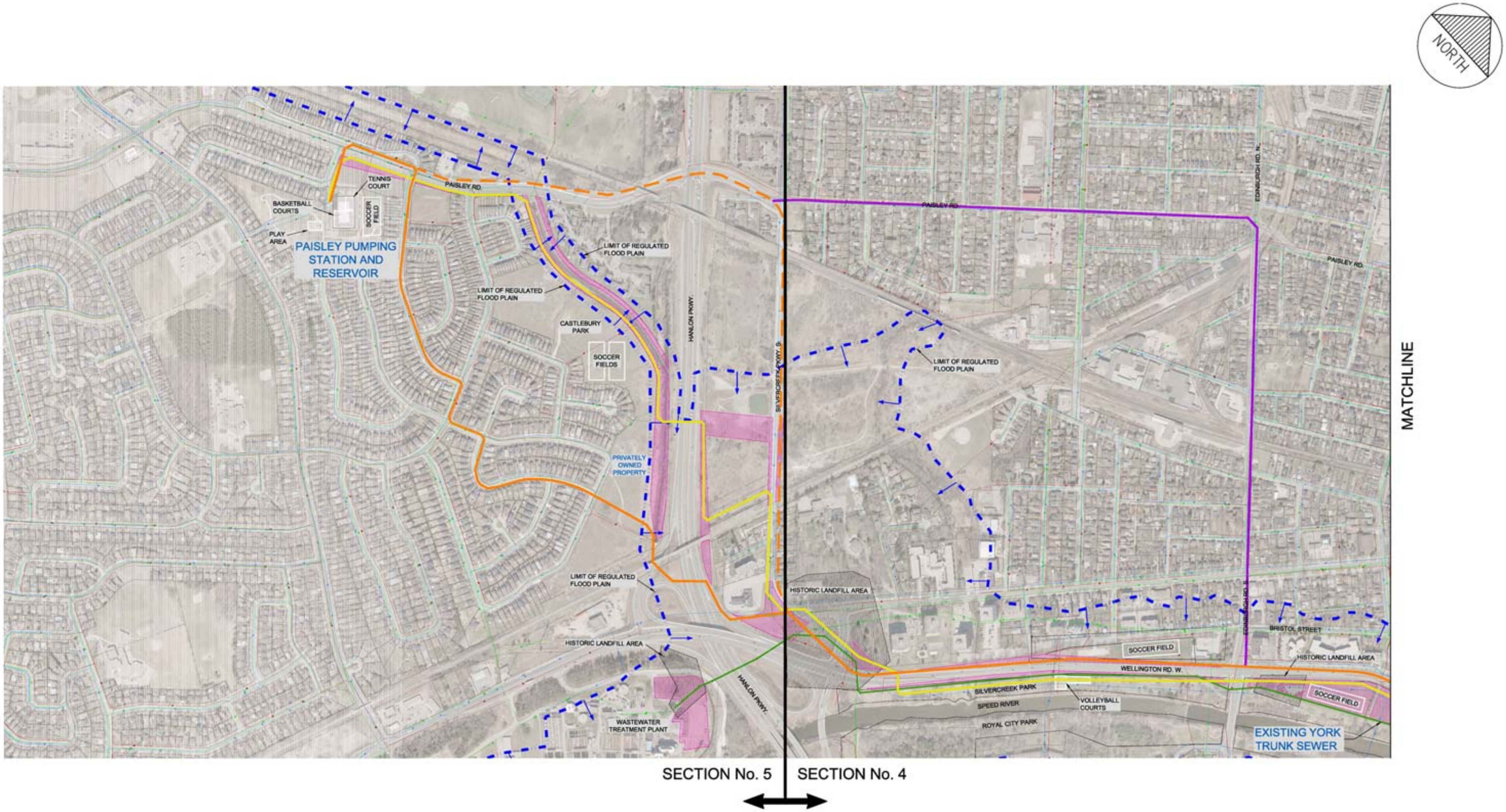
PREFERRED (Partial Replacement of Existing Sewer and Twinning)

LEGEND

Most Preferred (green) | Less Preferred (yellow) | Least Preferred (orange)

York Trunk Sewer – Alternative Evaluation Summary

GENIVAR



LEGEND

- MASTER PLAN ALTERNATIVE
- MASTER PLAN ALTERNATIVE 'B'
- NEW ALIGNMENT No. 2
- NEW ALIGNMENT No. 3
- NEW ALIGNMENT No. 4
- NEW ALIGNMENT No. 5

- UNCERTAIN ARCHAEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRES STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION
- HIGH ARCHAEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED

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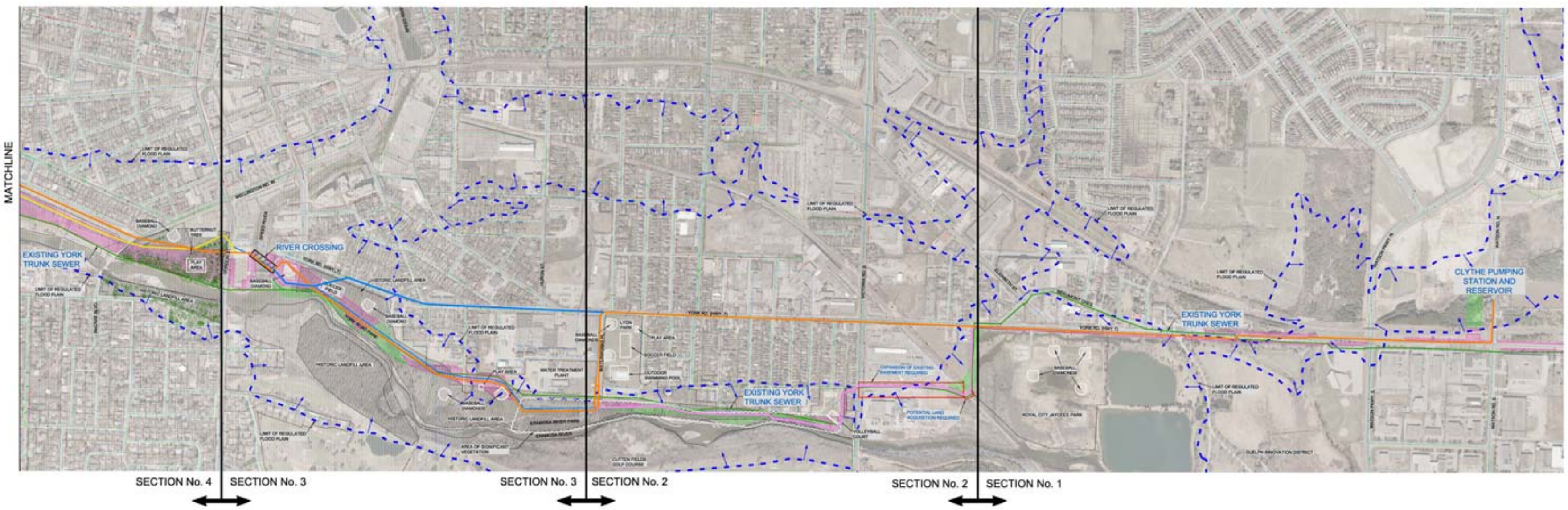
PAISLEY-CLYTHE FEEDERMAIN
CLASS ENVIRONMENTAL ASSESSMENT
ALTERNATIVES REVIEWED
SHEET 1 OF 2

SCALE: 1:2500

GENIVAR



LEGEND

MASTER PLAN ALTERNATIVE	NEW ALIGNMENT No. 3
MASTER PLAN ALTERNATIVE 'B'	NEW ALIGNMENT No. 4
NEW ALIGNMENT No. 2	NEW ALIGNMENT No. 5

UNCERTAIN ARCHAEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRES STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION

HIGH ARCHAEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED

PAISLEY-CLYTHE FEEDERMAIN
CLASS ENVIRONMENTAL ASSESSMENT
ALTERNATIVES REVIEWED
SHEET 2 OF 2

SCALE: 1:2500

GENIVAR

Do Nothing

- Maintain existing water distribution system.
- Does not meet identified future operational requirements.

Provide New Water Feedermain to Connect Clythe Pumping Station to Paisley Pumping Station Reservoir

- Provides improved east-west water transmission in Zone 1 of water distribution system.
- Provides a backup water supply if repairs are required at other points in the distribution system.
- Provides backup in the event of unexpected service interruptions.
- Opportunity of cost savings by performing work in conjunction with upgrades to the York Sanitary Trunk Sewer.
- Opportunity for future inter-connections to future Clair Road and Verney Water Tower feedermains.

Upgrade Existing Water Distribution Network

- Upgrade existing pipes to accommodate future growth and demand.
- Can be performed in conjunction with road works upgrades to other services.
- Does not provide effective system redundancy.
- May not provide for future demand or operations requirements (pressure, etc.).

Potential Alternatives & Opportunities – Paisley-Clythe Feedermain

York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

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Evaluation Criteria	Section 1	Section 2 (from Industrial Road to Waterworks Pl)		Section 3 (from Waterworks Pl to Gordon St)		Section 3 (Speed River Crossing)	
	Master Plan Alternative (along York Rd from Watson Rd. North) Distance: 1,800 m	New Alignment No.3 (down existing utility corridor, along PDI plant, to Eramosa River Park through to Waterworks Pl) Distance: 1,550 m	Master Plan Alternative (from Industrial Ave, down York Rd, down Waterworks Pl) Distance: 1,700 m	New Alignment No. 2 (from Waterworks Pl to Speed River via York Road) Distance: 1,100 m	Master Plan Alternative (from Waterworks Pl to Speed River via York Road Park) Distance: 1,200 m	Master Plan Alternative (Speed River Crossing to Gordon St.) Common alignment – Open Cut Crossing Distance: 190 m	Master Plan Alternative (Speed River Crossing to Gordon St.) Common alignment – Tunneled Undercrossing Distance: 190 m
Natural Environment Overall Rating	• Located Within Existing Road Allowance, which is Already Disturbed • Adjacent to Designated Natural Heritage Area South of York Road	• Located Within Existing Utility Easement • Disturbance to Trees and Vegetation in Eramosa River Park • Passes through Designated Natural Heritage and Restoration Area and Wetland	• Located Within Existing Road Allowance	• Located Within Existing Road Allowance • Potential Disturbance of Historic Landfill • Passes through Designated Natural Heritage and Restoration Area	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in York Road Park • Potential Disturbance of Historic Landfill • Passes through Designated Natural Heritage and Restoration Area	• Tree Removal Required on both Sides of Speed River • Open Cut of River Bottom will Disturb Wildlife Habitat • River is Part of Natural Heritage System	• Staging and Receiving Pits will Require Large Excavations • May Disturb Bedrock Formations and Groundwater • River is Part of Natural Heritage System
Social and Cultural Overall Rating	• Located Within Existing Built-Up Area • Potential for Performing Work in Conjunction with Expansion of York Road to Minimize Disruption to Local Residents and Businesses	• Work Will Impact use of Eramosa River Park • Limited Disturbance to Roads and Traffic	• Alignment Along York Road Would Cause Disruption to Local Businesses and Residents • York Road / Victoria Road reconstructed	• Alignment along York Road would Cause Disruption to Local Businesses and Residents	• Construction Will Impact use of York Road Park • Limited Disturbance to Roads and Traffic	• Disturbance to Park use • Section of River Impacted not Typically used for Recreation	• Significant Disturbance to Park and Public Use on Both Sides of the River for Tunneling Works
Technical Overall Rating	• Limited Conflict with Existing Utilities • Railroad Crossing Required at Ontario and Southland	• Feedermain Installation in Eramosa River Park May be Performed in Conjunction with Twinning of York Trunk Sewer • Railroad and Road Crossing Required	• Potential Conflicts With Existing Utilities in Road Allowance • No Synergy with other Proposed Works (York Trunk)	• Potential Conflicts with Existing Utilities in Road Allowance • No Synergy with other Proposed Works (York Trunk)	• Feedermain Installation in York Road Park May be Performed in Conjunction with Twinning of York Trunk Sewer	• Feedermain Installation may be Performed in Conjunction with Twinning of York Trunk Sewer • Open Cut of River Bottom Will Require Cofferdams and Dewatering	• Trenchless Installation of Watermain Will Require Staging Pits in Addition to Dewatering • Cannot be Installed in Conjunction with Twinning of York Trunk Sewer
Economic Overall Rating	• Capital Cost: est. $2.5M	• Additional Land Acquisition Likely Required • Capital Cost: est. $1.5M	• Capital Cost: est. $2.3M	• Capital Cost: est. $1.6M	• Capital Cost: est. $1.3M	• Capital Cost: est. $400,000 in Conjunction with Installation of York Trunk Sewer	• Capital Cost: est. $1.2M in Conjunction with Installation of York Trunk Sewer
OVERALL PREFERENCE RATING	**PREFERRED**	**PREFERRED**			**PREFERRED**	**PREFERRED**	

LEGEND

Most Preferred | Less Preferred | Least Preferred

Paisley-Clythe Feedermain – Alternative Evaluation Summary

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

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Evaluation Criteria	Section 4 (from Gordon Street to the Hanlon Parkway)			Section 5 (from the Hanlon Parkway to Paisley Road Booster Station)		
	Master Plan Alternative (West through Silvercreek Park, crossing to the north side of Wellington Street) Distance: 2,100 m	New Alignment No. 4 (West through Silvercreek Park following along the south side of Wellington Street) Distance: 2,300 m	New Alignment No.5 (following the Master Plan alternative, but turning north up Edinburgh and West Paisley Road to the Hanlon Expressway) Distance: 2,100 m	Master Plan Alternative (West Across the Hanlon Expressway and Northwest though the subdivision to Paisley Booster Station) Distance: 2,000 m	Master Plan Alternative 2 (North on Silvercreek Parkway South to Paisley Road, crossing the Hanlon, and following Paisley Road to the Paisley Booster Station) Distance: 1,800 m	New Alignment No. 4 (North on Silvercreek Road Parkway, through a tract of municipally owned land and up the west side of the Lafarge lands, crossing the Hanlon Expressway, and along a municipal drain to Paisley Road) Distance: 1,900 m
Natural Environment Overall Rating	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in Silvercreek Park • Potential Disturbance of Contaminated Soils and Groundwater	• Located within Existing Utility Corridor • Disturbance to Trees and Vegetation in Silvercreek Park • Potential Disturbance of Contaminated Soils and Groundwater • Passes Through Designated Natural Heritage and Restoration Area	• Located Primarily in Existing Road Allowances (i.e. Disturbed Area)	• Located Primarily in Existing Road Allowance (i.e. Disturbed Area)	• Located Primarily in Existing Road Allowance (i.e. Disturbed Area)	• Located Primarily in Lands Proposed to be Developed or Within Municipal Easement • Feedermain Proposed to be Installed adjacent to Municipal Drain • Passes Through Designated Natural Heritage and Restoration Area
Social and Cultural Overall Rating	• Construction will Impact use of Silvercreek Park	• Construction will Impact use of Silvercreek Park	• Alignment on Paisley Road and Edinburgh Road would cause Disruption to Local Businesses and Residents	• Alignment within Subdivision Would Cause Disruption to Local Residents • Alignment Crosses Privately Owned Land • May Require Easement of Property Acquisition	• Principally within Road Allowance • Potential Impact on Private Properties and Traffic during Construction	• Principally Within Municipally Owned Property • Limited Impact on Private Properties
Technical Overall Rating	• Some Conflicts with Existing Services in Silvercreek Park • May be Performed in Conjunction with Twinning of York Trunk Sewer • Four Road Crossings Required	• Some Conflicts with Existing Services in Silvercreek Park • May be Performed in Conjunction with Twinning of York Trunk Sewer • Five Road Crossings Required	• Potential Conflicts with existing Utilities Located in Road Allowance • No Synergy with Other Works • Multiple Road Crossings and Two Railroad Crossing are Required	• Limited Conflict with Existing Utilities • Undercrossing of Hanlon Expressway and One Railroad Required • Various Crossings of Roads in Residential Subdivision	• Feedermain Installation may be Coordinated with Development of Lafarge Lands along Silvercreek Parkway South • Potential Conflicts with Future MTO Developments at Paisley Road	• Feedermain Installation may be Coordinated with Development of Lafarge Lands along Silvercreek Parkway South • Potential Synergy with Installation of Sanitary Sewer under Hanlon Expressway Associated with Development of Lafarge Lands
Economic Overall Rating	• Capital Cost: est $2.2M	• Capital Cost: est. 1.9M	• Capital Cost: est. $2.9M	• Capital Cost: est. $2.9M	• Capital Cost: est. $2.7M	• Capital Cost: est $2.5M
OVERALL PREFERENCE RATING						
		PREFERRED				**PREFERRED**

LEGEND

Most Preferred (green) · Less Preferred (yellow) · Least Preferred (orange)

Paisley-Clythe Feedermain – Alternative Evaluation Summary

GENIVAR

Description:

- New trunk sewer to twin or replace sections of the existing York Trunk Sewer where existing sewer is approaching or exceeding capacity.
- New pipe size varies from 1,050 mm (42”) to 1,200 mm (48”)

Rationale for Preferred Alignment:

- Mitigates surcharging and allows for reuse of and (as required) rehabilitation of the existing Trunk Sewer
- Provides additional flow capacity for future growth of the City to at least 2041.
- Provides opportunity for realignment of sewer to allow for expansion at F.M. Woods Pumping Station.
- Provides opportunity for relieve flows in the Speed Trunk Sewer by diverting flow into the upgraded York Trunk Sewer, thus extending the life of that system.

Disadvantages of Other Alternatives:

- Does not allow for future growth.
- Repairs/upgrades to existing Trunk Sewer are limited due to capacity constraints.
- Existing sewer conflicts with future expansion of water plant.
- Access to existing sewer for maintenance is limited in some locations (i.e. by Gordon Street crossing).

Cost Estimate:

Total Cost: $19.4 M

Including: Sewer Replacement, River Crossing, Allowance for Dewatering of Contaminated Ground Water, Allowance for Disposal of Contaminated Soils, Detailed Design and Construction Administration, Contingency Allowance

York Trunk Sewer – Preferred Alternative

Description:

- A new feedermain between the F.M. Woods Pumping Station and the Clythe and Paisley Booster Stations, at the east and west ends of the City, respectively.

SECTION 1 – CLYTHE BOOSTER STATION TO INDUSTRIAL ROAD

Rationale for Preferred Alignment:

- Located within existing road allowance.
- May be excavated in conjunction with future expansion of York Road to four lanes.
- Limited conflict with existing utilities.

SECTION 2 – INDUSTRIAL ROAD TO F.M. WOODS PUMPING STATION

Rationale for Preferred Alignment:

New Alignment 3

- Located within existing utility corridor and publically owned land.
- Limited disturbance to roads and traffic.
- Disturbance of trees and vegetation in Eramosa River Park can be mitigated by renaturalization and replanting.
- Limited conflict with existing utilities.
- Can share construction corridor with York Trunk Sewer.

Disadvantages of Other Alternatives

Master Plan Alternative:

- Significant impact to traffic and private property due to limited space available within existing road allowance.
- Potential conflicts with existing utilities, railways, etc.
- Higher capital cost.

Paisley-Clythe Feedermain – Preferred Alternative

SECTION 3 – WATERWORKS PLACE TO GORDON STREET

Rationale for Preferred Alignment

Master Plan Alternative:

- Located within existing utility corridor.
- Limited disturbance to existing roads and traffic.
- Disturbance of trees and vegetation in York Road Park can be mitigated by renaturalization and replanting.
- Synergy with upgrades to York Trunk Sewer.

Disadvantages of Other Alternatives

New Alignment No. 2:

- Significant impact to traffic and private property due to construction.
- Potential conflict with existing utilities.
- Higher capital costs.

SECTION 3 - SPEED RIVER CROSSING

Rationale for Preferred Alignment

***Open Cut*:**

- Disturbance of trees and vegetation in Eramosa River Park can be mitigated by renaturalization and replanting.
- Opportunity to perform work in conjunction with upgrades to York Trunk Sewer.
- Lower capital cost.

Disadvantages of Other Alternatives

Tunneled Undercrossing:

- Staging and receiving pits require large excavations.
- Extensive disturbance to park use and facilities.
- May disturb bedrock formations.
- Limited ability to phase with other works.

Paisley-Clythe Feedermain – Preferred Alternative

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SECTION 4 – SILVERCREEK PARK TO WELLINGTON ROAD

Rationale for Preferred Alignment

New Alignment 4:

- Located within existing utility corridor.
- Limited disturbance to existing roads and traffic.
- Disturbance of trees and vegetation in Silver Creek Park can be mitigated by renaturalization and replanting.
- Synergy with upgrades to York Trunk Sewer.

Disadvantage of Other Alternatives

Master Plant Alternative:

- Higher capital cost.

New Alignment No. 5:

- Significant disruption to local businesses and residents.
- Potential conflicts with existing utilities.
- Multiple road and railroad crossings required.
- Higher capital costs.

SECTION 5 – HANLON ROAD TO PAISLEY ROAD BOOSTER STATION

Rationale for Preferred Alignment

New Alignment 4:

- Generally Located within Municipal property.
- Limited impact to private properties.
- Synergy with development of Lafarge Lands.

Cost Estimate:

Total Estimated Cost: $17.8 M

Including: Feedermain Installation, Allowance for Dewatering of Contaminated Groundwater, Allowance for Disposal of Contaminated Soils, Detailed Design and Construction Administration. This cost assumes a common trench with the York Trunk Sewer for the Speed River Undercrossing

Disadvantage of Other Alternatives:

Master Plant Alternative:

- Routing through subdivision would cause significant disruption to residents.
- Would require land acquisition / easement.
- High capital cost.

Master Plant Alternative 2:

- Potential conflict with future MTO development.
- Potential disruption to traffic and private properties.

Paisley-Clythe Feedermain – Preferred Alternative

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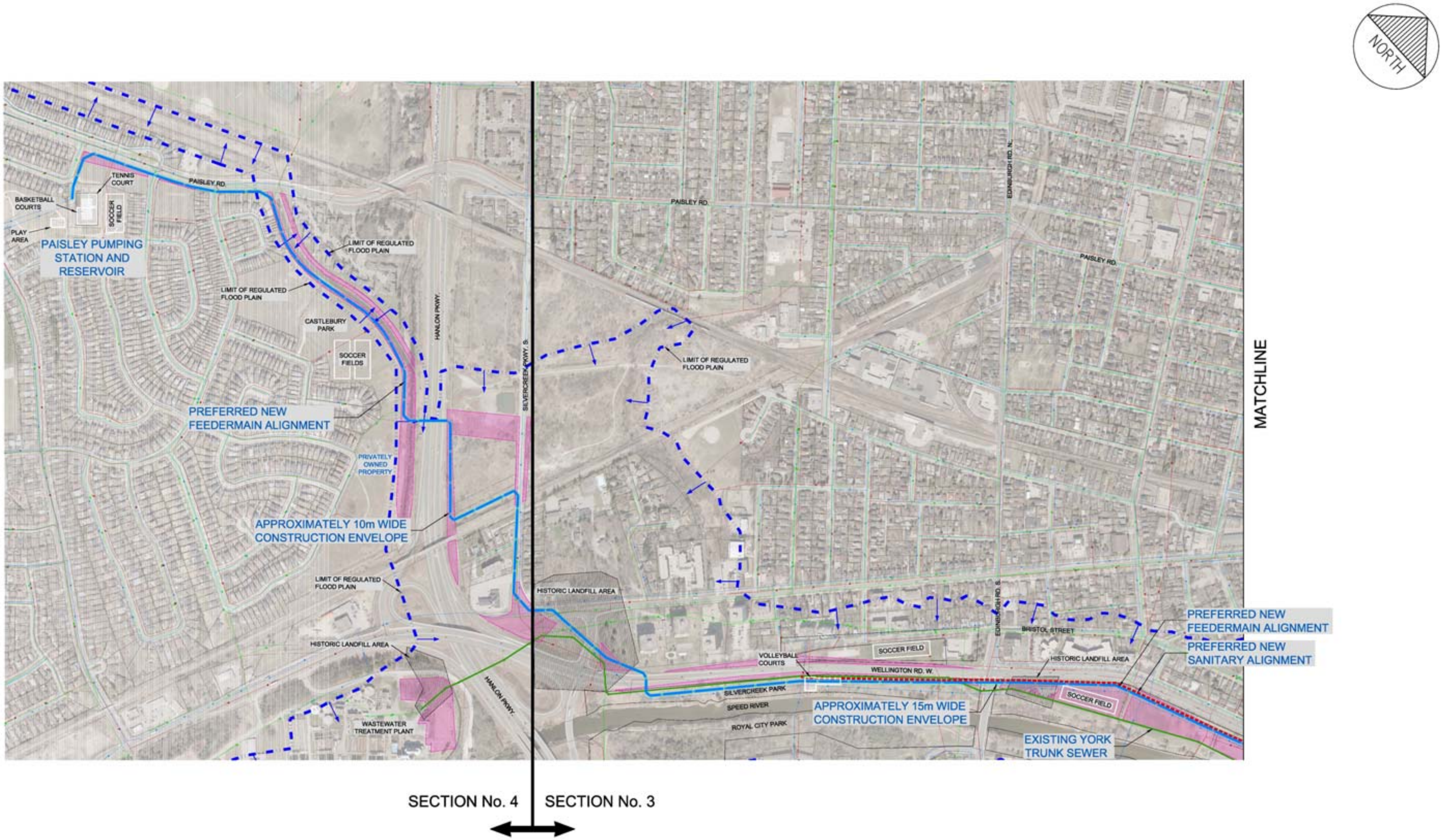

LEGEND

- UNCERTAIN ARCHAEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRES STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION
- HIGH ARCHAEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED

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YORK TRUNK SEWER AND
PAISLEY-CLYTHE FEEDERMAIN
PREFERRED ALIGNMENTS
SHEET 1 OF 3

SCALE: 1:2500

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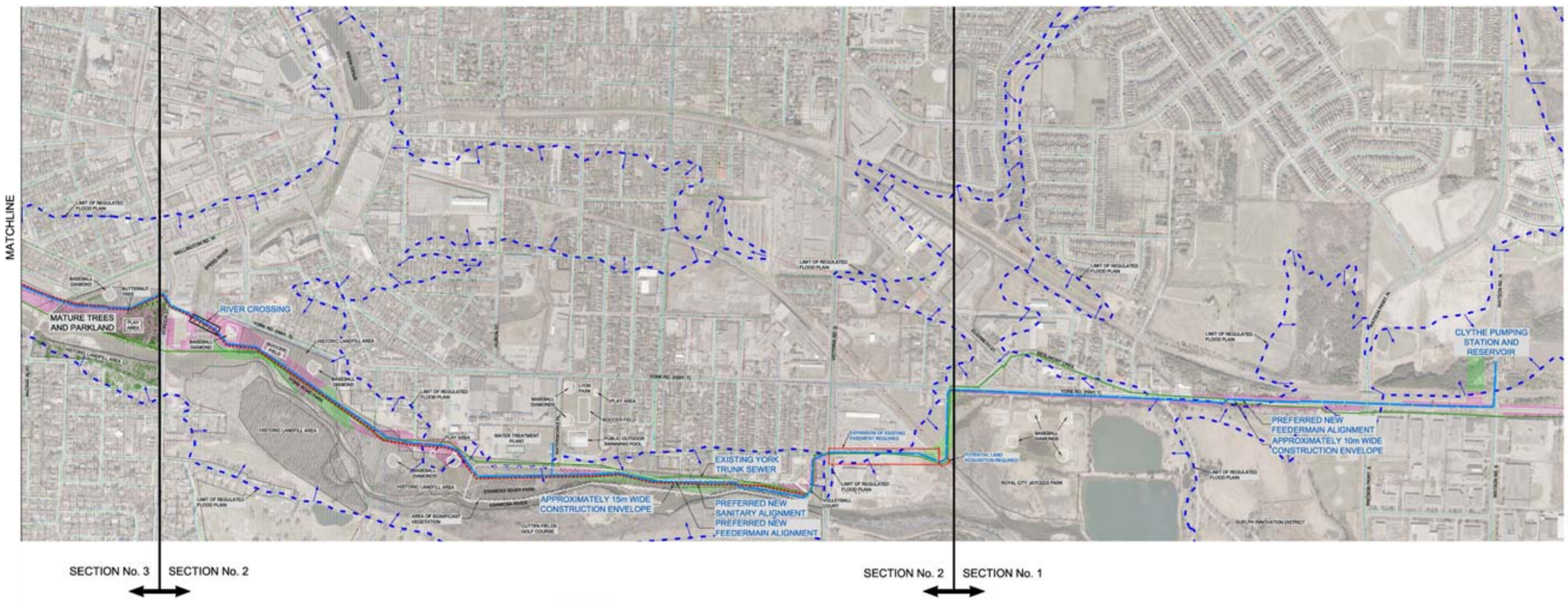

LEGEND

UNCERTAIN ARCHAEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRES STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION

HIGH ARCHAEOLOGICAL POTENTIAL: NOT PREVIOUSLY DISTURBED

YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN PREFERRED ALIGNMENTS
SHEET 2 OF 3

SCALE: 1:2500

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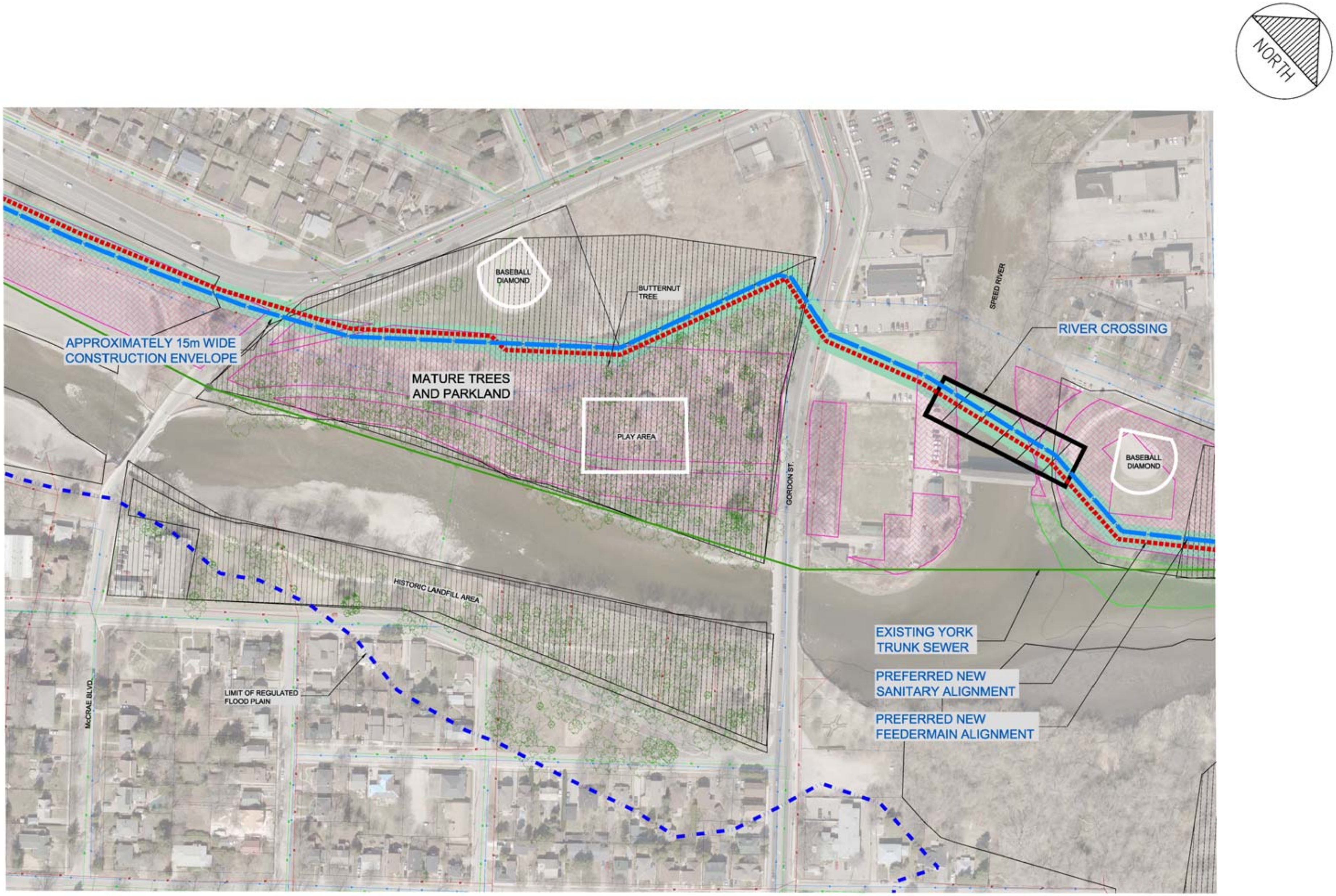

YORK TRUNK SEWER AND PAISLEY-CLYTHE FEEDERMAIN PREFERRED ALIGNMENTS RIVER CROSSING SHEET 3 OF 3

LEGEND

UNCERTAIN ARCHAEOLOGICAL POTENTIAL: LAND MAY HAVE BEEN AFFECTED BY ADJACENT DEVELOPMENT, REQUIRES STAGE 2 ASSESSMENT PRIOR TO CONSTRUCTION

SCALE: 1:750

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

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1. Sheet Piling is Installed Across the River

2. Water Flow is Diverted Across the Channel, Excavation is Pumped Out

3. Construction Begins…

4. The River is Restored

Construction Methods – Open Cut River Crossings

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Open-Cut Sewer Construction on a Road Shoulder

Typical Open-Cut Sewer Trench

Typical Construction Crew

Use of a Trench Box

Construction Methods – Open Cut

York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

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Proximity to Natural Heritage Features/Vegetation

- Maintain natural heritage buffers as setbacks
- Protect Species-at-Risk in the area of work (butternut tree, turtles, etc.) through routing of infrastructure, identification, and scheduling of work

Groundwater/Subsurface Conditions

- Develop alternatives to minimize impacts
- Locate construction activities away water bearing formations (soils) where possible
- Use proper dewatering techniques, including treatment of impaired groundwater and options to minimize necessary water taking
- Scheduling to avoid seasonal high groundwater levels (i.e. Spring)
- Employ environmental management practices during construction (equipment storage, refueling, etc.)
- Maintenance of the existing groundwater regime through engineering design (i.e. backfill to match existing conditions)

Crossing Natural Features

- Avoid Wetland areas south of York/Wellington Road adjacent to Speed River / Eramosa River
- Reinstate to improved end state conditions including naturalization and promotion of wildlife habitats

Watercourse Crossing and Fisheries

- Minimize tree removal
- Stage work to non-critical times (i.e. outside of fish spawning season March 31st - July 31st)
- Restore stream bed to pre-construction condition or better
- Schedule work around seasonal constraints (high water levels in spring, land uses)
- Implement spill control and emergency management through out works
- Maintain natural heritage buffers and setbacks

Proximity to Valley Lands and Flood Plains

- Restoration of impacted vegetation
- Use of indigenous (native) species
- Inventory of work to avoid nesting and breeding areas prior to any removal of vegetation
- Minimize tree removal and implement reinstatement plan consistent with the City's Natural Heritage System Approvals

Natural Environmental Mitigation Measures

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

The City of Guelph
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- Proximity to Built-up Areas
- Traffic Impacts during Construction
- Known Archaeological Features
- Private Properties Affected
- Impact on Recreation Areas

Impact on Recreation Areas

- Staging of construction to minimize disruption to sports field and parks use (late fall – early spring)
- Preserve or reinstate existing amenities: flower gardens, playground equipment, sport fields, etc.

Archeological Features

- Perform a Stage 2 Archeological Assessment prior to construction to identify any artifacts or features in the identified area of work.
- Stage 3 Archeological Assessment as required with on-site Archaeologist within key areas during construction

Proximity to Built-up Areas/Private Properties Affected:

- Employ noise and dust control measures
- Maintain pedestrian walkway system by providing temporary detours around areas of work

Traffic Impacts During Construction

- Consult with public services (mail, garbage collection, transit, etc.) and adjacent landowners regarding temporary access routes and provision of services during construction
- Phase construction to minimize period of disruption
- Ensure mandatory access for emergency response vehicles/personnel
- Schedule work with other capital projects to avoid duplication of disruptions

Social & Cultural Mitigation Measures

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York Trunk Sewer and Paisley-Clythe Feedermain

Municipal Class Environmental Assessment

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Following this Public Information Centre, all comments received from the public and all review agencies will be incorporated into the analysis of the preferred alternatives for the York Trunk Sewer and Paisley-Clythe Feedermain alignments. Please complete a survey form and submit it to a representative at tonight's Public Information Centre or send it to the project contacts:

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Development of Project File Notice of Completion - Fall 2011

30 Day Public Review Period - Fall 2011

Detailed Design, Permits, Approvals - 2012

Sewer and Feedermain Construction - Fall 2013-2018

Next Steps

GENIVAR

Appendix J

Mandatory Contact List

Mandatory Contact List – York Trunk Sewer & Paisley-Clythe Feedermain Schedule B Class Environmental Assessment

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Guelph Ontario N1H 3A1

Mandatory Contact List – York Trunk Sewer & Paisley-Clythe Feedermain Schedule B Class Environmental Assessment

Fire Chief Shawn Armstrong
Director of Emergency Services, City of Guelph
Fire & Emergency Services
50 Wyndham Street South
Guelph Ontario N1H 3A1

Mr. Derek McCaughan
Director of Operations, City of Guelph
Operations
45 Municipal Street
Guelph Ontario N1G 1G8

Mr. Peter Busatto
Manager of Waterworks, City of Guelph
Planning, Engineering and Environmental Services
Waterworks
29 Waterworks Place
Guelph Ontario N1H 3A1

Mr. Richard Henry
City Engineer, City of Guelph
Planning, Engineering and Environmental Services
Engineering Services
1 Carden Street
Guelph Ontario N1H 3A1

Mr. Gary Cousins
Director of Planning, County of Wellington
74 Woolwich Street
Guelph Ontario N1H 3T9

Mr. Rajan Philips
Manager of Development Engineering and Transportation Planning, City of Guelph
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Engineering Services
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Guelph Ontario N1H 3A1

Mr. Cameron Walsh
Manager of Wastewater, City of Guelph
Planning, Engineering and Environmental Services
Wastewater
530 Wellington Street
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Mr. Sam Mattina
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Guelph Ontario N1H 3A1

Mr. Scott Hannah
Manager of Development and Parks Planning, City of Guelph
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Planning and Building Services
1 Carden Street
Guelph Ontario N1H 3A1

Mr. Don Kudo
Manager of Design and Construction and Infrastructure Planning, City of Guelph
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Engineering Services
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Guelph Ontario N1H 3A1

Ms. Janet Laird
Executive Director of Planning, Engineering and Environmental Services, City of Guelph
Planning, Engineering and Environmental Services
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Guelph Ontario N1H 3A1

Mr. Jim Riddell
General Manager, Planning and Building Services, City of Guelph
Planning, Engineering and Environmental Services
Planning and Building Services
1 Carden Street
Guelph Ontario N1H 3A1

Ms. Suzanne Young
Environmental Planner, City of Guelph
Planning, Engineering and Environmental Services
Policy Planning and Urban Design
1 Carden Street
Guelph Ontario N1H 3A1

Mandatory Contact List – York Trunk Sewer & Paisley-Clythe Feedermain Schedule B Class Environmental Assessment

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Planning, Engineering and Environmental Services
Policy Planning and Urban Design
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Guelph Ontario N1H 3A1

Chief Rob Davis
City of Guelph Police Department
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Guelph Ontario N1H 4C6

Grand Chef Konrad Sioui
Conseil de la Nation Huronne-Wendat
255 Place Chef Michel Laveau
Wendake Quebec G0A 4V0

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County Engineer, County of Wellington
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Ms. Vaille Laur
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1 Carden Street
Guelph Ontario N1H 3A1

Ms. Jessica McEachren
Environmental Planner/Staff Coordinator, Environmental Advisory Committee
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Guelph Ontario N1H 3A1

Mr. Mark Wright
Inspections Supervisor, Fisheries and Oceans Canada
Central and Arctic Region
201 Front Street North Suite 703
Sarnia Ontario N7T 8B1

Mr. Rick Kiriluk
Fish Habitat Biologist, Southern Ontario, Fisheries and Oceans Canada
304-3027 Harvester Road P.O. Box 85060
Burlington Ontario L7R 4K3

Mr. Ken Hammill
, Friends of Guelph
18 Elmridge Drive
Guelph Ontario N1H 4X7

Mr. Mark Anderson
Water Quality Engineer, Grand River Conservation Authority
400 Clyde Road P.O. Box 729
Cambridge Ontario N1R 5W6

Mr. James Etienne
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400 Clyde Road P.O. Box 729
Cambridge Ontario N1R 5W6

Mr. Fred Natolochny
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400 Clyde Road P.O. Box 729
Cambridge Ontario N1R 5W6

Mr. John Palmer
Senior Water Resources Engineer, Grand River Conservation Authority
400 Clyde Road P.O. Box 729
Cambridge Ontario N1R 5W6

Mr. Gus Rungis
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Cambridge Ontario N1R 5W6

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Guelph and District Homebuilders Association
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Mandatory Contact List – York Trunk Sewer & Paisley-Clythe Feedermain Schedule B Class Environmental Assessment

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147 Wyndham Street North Suite 405 PO Box 1311
Guelph Ontario N1H 6N6

Ms. Elysia DeLaurentis
Guelph Historical Society
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Guelph Ontario N1H 2Y6

Ms. Josee Beauregard
Litigation Team Leader, Ontario/Numavut, Indian and Northern Affairs Canada
Litigation Management and Resolution Branch
10 Wellington Street
Gatineau Quebec K1A 0H4

Mr. Sean Darcy
Indian and Northern Affairs Canada
Assessment and Historical Research Directorate
10 Wellington Street
Gatineau Quebec K1A 0H4

Indian and Northern Affairs Canada
Environmental Unit
25 St. Clair Avenue East 8th Floor
Toronto Ontario M4T 1M2

Mr. Jefferey Betker
Senior Policy Analyst, Indian and Northern Affairs Canada
Office of the Federal Interocular for Metis and Non-status Indians
66 Slater Street Room 1218
Ottawa Ontario K1A 0H4

Ms. Heather Levecque
Manager, Consultation Unit, Ministry of Aboriginal Affairs
Consultation Unit
160 Bloor Street East 9th Floor
Toronto Ontario M7A 2E6

Mr. Lloyd Longfield
President and CAO, Guelph Chamber of Commerce
15-485 Silvercreek Parkway P.O. Box 1268
Guelph Ontario N1H 6N6

Mr. Andrew Lambden
Guelph Development Association
c/o Terra View Homes
45 Speedvale Avenue East Unit #5
Guelph Ontario N1H 1J2

Mr. Charles Esendal
Sustainment Manager, Hydro One Networks
Lines Information Systems and Programs
483 Bay Street TCT15-A11 North Tower
Toronto Ontario M5G 2P5

Mr. Don Boswell
Senior Claims Analyst, Indian and Northern Affairs Canada
10 Wellington Street
Gatineau Quebec K1A 0H4

Ms. Louise Trepanier
Indian and Northern Affairs Canada
Director Comprehensive Claims Branch
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Gatineau Quebec K1A 0H4

Ms. Linda MacWilliams
Indian and Northern Affairs Canada
Lands and ART Lands and Trust Services
25 St. Clair Avenue East 8th Floor
Toronto Ontario M4T 1M2

Ms. Laura Murr
Kortright Hills Community Association
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Mandatory Contact List – York Trunk Sewer & Paisley-Clythe Feedermain Schedule B Class Environmental Assessment

Ms. Susan Picarello
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Ministry of Aboriginal Affairs
720 Bay Street 4th Floor
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Ms. Anna Dowdall
Manager, Aboriginal Policy and Coordination Unit,
Ministry of Community Safety and Correctional Services
25 Grosvenor Street 9th Floor
Toronto Ontario M7A 1Y6

Mr. Bruce Curtis
Manager, Community Planning and Development,
Ministry of Municipal Affairs and Housing
659 Exeter Road 2nd Floor
London Ontario N6E 1L3

Mr. Mike Stone
District Planner, Ministry of Natural Resources
Guelph District Office
1 Stone Road West
Guelph Ontario N1G 4Y2

Mr. Barry Duffey
Manager, Ministry of the Environment
Air, Pesticides and Environmental Planning
119 King Street West 12th Floor
Hamilton Ontario L8P 4Y7
905-521-7639

Ms. Barb Slattery
Environmental Resource Planner/EA Coordinator,
Ministry of the Environment
Air, Pesticides and Environmental Planning
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Ms. Margaret Sault
Mississaugas of the New Credit First Nations
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Hagersville Ontario N0A 1HO

Ms. Carol Neumann
Rural Planner, Ministry of Agriculture and Food
Food Safety and Environmental Policy Branch
Wellington Place R.R. #1
Fergus Ontario N1M 2W3

Mr. Richard Mortimer
Director, Programs and Services Branch, Ministry of Culture
Culture Policy, Programs and Services Division
400 University Avenue
Toronto Ontario M7A 2R9

Mr. Ken Cornelisse
Water Resources Coordinator, Ministry of Natural Resources
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Ms. Linda Johnson
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Mandatory Contact List – York Trunk Sewer & Paisley-Clythe Feedermain Schedule B Class Environmental Assessment

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Secretary, River Systems Advisory Committee
c/o City of Guelph Community Design and Development Services
1 Carden Street
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Ms. Jessica McEachren
Environmental Planner/Staff Coordinator, River Systems Advisory Committee
c/o City of Guelph Community Design and Development Services
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Rogers Cable
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Mr. Lonnie Bomberry
Director, Six Nations (Elected) Band Council (and Staff) Six Nations of the Grand River
Land & Resources Department
2498 Chiefswood Road P.O. Box 5000
Ohsweken Ontario N0A 1M0

Mr. Paul General
Wildlife Officer, Six Nations (Elected) Band Council (and Staff) Six Nations of the Grand River
2499 Chiefswood Road P.O. Box 5001
Ohsweken Ontario N0A 1M1

Chief William Montour
Six Nations of the Grand River
P.O. Box 5000 1695 Chiefswood Road
Oshweken Ontario N0A 1M0

Mr. Leroy Hill
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Haudenosaunee Confederacy Council
Haudenosaunee Resource Centre
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Ohsweken Ontario N0A 1M2

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Clerk/CAO, Township of Guelph-Eramosa
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Ms. Dolly Goyette
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West Region Office
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Mandatory Contact List – York Trunk Sewer & Paisley-Clythe Feedermain Schedule B Class Environmental Assessment

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c/o Harden Environmental
RR #1
Moffatt Ontario L0P 1J0

Ms. Brenda Law
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Planning Department
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Mr. Dan Duszczyszyn
Superintendent of Corporate Services and Treasurer, Wellington Catholic School Board
Transportation Department
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Mr. Scott Hutchison
Program Manager, Wellington Dufferin Guelph Public Health
Health Protection Division
600 Southgate Drive
Guelph Ontario N1G 4P6

Appendix K

Copy of Mandatory Contact Letter

Notice of Project Commencement and Invitation to Participate

York Sanitary Trunk Sewer and
Paisley-Clythe Drinking Water Feedermain
Class Environmental Assessment

The Projects

The current York Sanitary Trunk Sewer extends from the former Guelph Reformatory Lands to the Wastewater Treatment Plant located west of the Hanlon Expressway along the Eramosa and Speed Rivers. The sewer is reaching the end of its useful service life and is approaching its design capacity due to a combination of increases in the population serviced by the trunk sewer and infiltration/inflow into the sewer.

The Paisley-Clythe Drinking Water Feedermain is a new watermain identified in the City's 2006 Water Supply Master Plan to increase the reliability of the water supply between the Woods Water Plant and the Paisley and Clythe Reservoirs at the west and east ends of the City.

A Schedule B Class Environmental Assessment is required to investigate all alternative solutions to increase the reliability of both the wastewater collection and water distribution systems.

The Process

The York Sanitary Trunk Sewer and Paisley-Clythe Drinking Water Feedermain Project will be conducted in accordance with the "Municipal Class Environmental Assessment" (Municipal Engineers Association, June 2000 as amended in 2007) which is an approved process under the Ontario Environmental Assessment Act. The Class Environmental Assessment process includes public and review agency consultation, an evaluation of alternatives, an assessment of potential environmental effects of the proposed projects, and identification of reasonable measures to mitigate any adverse impacts that may result.

How to Participate

This fall, community members and interested parties will be invited to attend the first of two Public Information Centres to review and discuss issues related to the York Sanitary Trunk Sewer and Paisley-Clythe Drinking Water Feedermain. Meeting dates and details will be advertised and posted in the meeting and event calendar at www.**guelph.ca**.

For more information

Please contact either one of our project team members if you have questions, comments or would like to be added to the project mailing list:

Mr. Colin Baker, P. Eng.
Environmental Engineer
City of Guelph
1 Carden St
Guelph, ON N1H 3A1
T (519) 822-1260 x 2282
E colin.baker@guelph.ca

Mr. James Witherspoon, P.Eng.
Project Manager
GENIVAR Consultants
1-367 Woodlawn Road West
Guelph, ON N1H 7K9
T (519) 827-1453
E jamie.witherspoon@genivar.com

www.guelph.ca/YorkPaisleyClythe

(This notice issued July 23, 2010)

City Hall
59 Carden St
Guelph, ON
Canada
N1H 3A1

T 519-822-1260
TTY 519-826-9771

guelph.ca

Appendix L

Correspondence

Ministry of Municipal Affairs and Housing

Municipal Services Office - Western

2nd Floor
659 Exeter Road
London ON N6E 1L3
Tel: 519 873-4020
Toll Free: 1 800-265-4736
Fax: 519 873-4018

Ministère des Affaires municipales et du Logement

Bureau des services aux municipalités - région de l'Ouest

2e étage
659 Exeter Road
London ON N6E 1L3
Tél. : 519 873-4020
Sans frais : 1 800 265-4736
Téléc. : 519 873-4018

Ontario

and Development Services

SEP 2 1 2010

September 15, 2010

Mr. Colin Baker, P. Eng.
Environmental Engineer
City of Guelph
1 Carden St.
Guelph, Ontario N1H 3A1

Dear Mr. Baker:

Re: **Notice of Project Commencement-Class Environmental Assessment York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain City of Guelph**

Thank you for your recent circulation of the above-noted matter. In this regard, we offer the following comments for your consideration.

It is understood this project is a Municipal Class Environmental Assessment for municipal water projects. The purpose of this project is to assess improvements to the York Trunk Sanitary Sewer and consider a new drinking water feedermain for the Paisley and Clythe Reservoirs. More specifically, this project will: (1) assess the existing infrastructure and the environment; (2) identify the problem and alternative solutions; (3) determine needs for future growth; (4) evaluate alternatives for routing, construction methods and mitigation measures; and (5) develop a preferred alternative to meet the project objectives for both the sewer and feedermain. It is also understood the City of Guelph's 2009 Water and Wastewater Servicing Master Plan identified the need for these improvements in order to service planned growth in the City.

This office provides access to provincial services on municipal government, finance and administration, as well as land use planning and development issues covered under the *Planning Act*. Section 2 of the *Planning Act* speaks to matters of provincial interest. This section directs decision-making bodies (whether it is a council of a municipality, a local board, a planning board, a minister of the Crown and a ministry, board, commission or agency of the government, or the Ontario Municipal Board) to be consistent with the policy statements issued under Section 3 of the *Planning Act* in exercising any authority that affects a planning matter.

The current policy on land use planning matters for Ontario, and specific to the City of Guelph, is the Provincial Policy Statement 2005 (PPS) and the Growth Plan. The PPS speaks to issues such as the promotion of efficient, cost-effective development and land use patterns, and the proper consideration of the various resources of this province. The PPS also speaks to matters dealing with public health and safety. The Growth Plan provides policy direction for growth management in the Greater Golden Horseshoe. The City of Guelph falls within the Growth Plan Area.

The requirements of the *Planning Act* apply to applications for planning approvals; these applications include official plan amendments and zoning bylaw amendments. As such, consideration should be given to applicable policies of the *Planning Act,* including the PPS and the Growth Plan. Both the PPS and the Growth Plan are to be read in their entirety and all relevant policies are to be applied to each situation. Where there is a conflict between the Growth Plan and the PPS, the Growth Plan prevails unless the conflict is between policies relating to the natural environment or human health. In these situations, the policies that provide more protection to the natural environment or human health prevail.

Based on our review of this particular matter, it appears that no planning approvals are being sought at this time. However, this project may have implications with respect to those matters covered by the PPS and the Growth Plan, as noted above. We recommend that you consider these policies in your review of this undertaking.

Additionally, you should ensure that the City of Guelph's Official Plan policies regarding municipal water services and management are integrated into the assumptions regarding the preferred solution(s) recommended under this evaluation process.

Finally, our comments on this undertaking should not be considered as approval for any other related applications under the *Planning Act* or other provincial legislation that may be required, may be related to, or may result from this project.

Please keep us on your circulation list for this project. If there are any questions or concerns on these comments, please contact me at (519) 873-4695 or by email at: Dwayne.Evans@ontario.ca

Yours truly,

Dwayne Evans

Dwayne Evans, M.A., MCIP, RPP
Planner
Municipal Services Office – Western

Ministry of the Environment
West Central Region

119 King Street West
12th Floor
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Tel.: 905 521-7640
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Ministère de l'Environnement

119 rue King ouest
12e étage
Hamilton (Ontario) L8P 4Y7
Tél. : 905 521-7640
Téléc. : 905 521-7820

Ontario

RECEIVED
and Development Services
SEP 02 2010
SEP - 1 2010
Community Design & Development Services

August 27, 2010

Mr. C. Baker, P. Eng.
City of Guelph
City Hall
1 Carden Street
Guelph, Ontario
N1H 3A1

Dear Mr. Baker:

Re: York Trunk Sanitary Sewer & Paisley-Clythe Drinking Water Feedermain
Notice of Project Commencement

Your Notice advising of the above-noted project commencement has been received. It is understood that this project is a result of the work undertaken in the 2009 Water and Wastewater Servicing Master Plan which identified the need to replace or rehabilitate the York Trunk Sanitary Sewer. The Master Plan also identified the need for a new watermain to increase the reliability of the water supply between the F.M. Woods facility and the Paisley and Clythe Reservoirs.

Typically, Notices of Commencement state whether the project(s) in question fall under Scheudle A, B or C of the Municipal Engineers Association's Class Environmental Assessment, as project classification determines the process. The Notice received does not indicate any schedule assignment. It is recommended that prior to the issuance of the next notice regarding this project, that this be done.

Please note that as part of the required stakeholder and agency consultation, proponents are advised to contact the following agencies to determine potentially affected Aboriginal communities in the project area. You are encouraged to visit the ministry's website at http://www.ene.gov.on.ca/en/eaab/aboriginal-resources.php for the most up to date contact list in this regard. Once identified, you are advised to provide notification directly to the Aboriginal communities who may be affected by the project and provide them with an opportunity to participate in any planned public consultation sessions and comment on the project.

Please continue to provide me with project-related notices and should you have any questions regarding the Class EA process, please do not hesitate to contact me at (905) 521-7864 or at Barbara.slattery@ontario.ca.

Thank you,

Barbara Slattery

Barbara Slattery
EA/Planning Coordinator

Affaires indiennes et du Nord Canada
www.ainc.gc.ca

Indian and Northern Affairs Canada
www.inac.gc.ca

Votre référence - Your file

Notre référence - Our file

Colin Baker
Environmental Engineer
City of Guelph
1 Carden Street
Guelph, Ontario N1H 3A1

RECEIVED

OCT 18 2010

Community Design & Development Services

Dear Mr. Baker

Re: York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment

I am writing in response to your letter inquiring about any claims that may affect the subject property. I regret that we were unable to respond earlier. Thank you for your invitation to the Public Information Centre, held on October 6, 2010. Unfortunately, we are unable to attend; however, the following information regarding active litigation may be useful to you as it could affect the lands that you are concerned with.

We can inform you that our inventory includes active litigation in the vicinity of this property. It is *Six Nations of the Grand River Band of Indians v. Attorney General for Canada and Her Majesty the Queen in Right of Ontario, Ontario Superior Court of Justice, filed in Brantford, court reference number 406/95.*

I am unable to comment with respect to the possible effect of this claim as the case has not yet been adjudicated and any statement regarding the outcome of the litigation would be speculative at this point. It is recommended that you consult legal counsel as to the effect this action could have on the lands you are concerned with.

If you are interested in further details about this claim, copies of the pleadings can be obtained from the Court for a fee. Please contact the appropriate Court Registry Office and make reference to the court file number listed above.

We cannot make any comments regarding claims filed under other departmental policies. For information on any claims you should also contact Don Boswell of the Specific Claims Branch at (819) 953-1940 to inquire about any Specific Claims. To inquire about any current Comprehensive Claims, please contact Nicole Cheechoo of Treaty and Aboriginal Government Central Operations at (819) 997-3499.

Canada

If you have any further questions please do not hesitate to contact me at (819)994-1947.

Sincerely,

Josée Beauregard
Litigation Team Leader
Eastern Litigation Directorate
Litigation Management and Resolution Branch

Andrew Tulk

From:	Jamie Witherspoon
Sent:	Wednesday, June 15, 2011 12:04 PM
To:	Carley Gratrix
Cc:	Andrew Tulk
Subject:	RE: York Trunk Sanitary Sewer

1. The estimated cost of the preferred alternative (Partial Replacement of Existing Sewer and Twining) on Pg 12 is $14.9M. On page 17, the total cost is indicated as $19.4M. Can you please indicate which one is correct?
   GENIVAR: Both are correct, the $14.9 is the construction cost, the $19.4 is the total cost including engineering and contingency.

2. Do you know which sanitary sewers will be twinned?
   GENIVAR: As illustrated on Page 10 (not numbered) of the hand-out, the sanitary sewer from Victoria Road to a few hundred metres west of Edinburgh is close to or over capacity at the end of the design period. Therefore that will be the section to be twinned.

3. Do you have a schematic showing the proposed changes in size?
   GENIVAR: Yes. Those will be included in the EA report; however, for the most part up until approximately Edinburgh, the pipe will be 1050mm diameter and after that it will be 1200mm diameter. The sizing of the pipe is based more on achieving minimum velocity in the pipe rather than capacity.

Please let me know if you need additional information.
Thanks
James

No. of Attachments: 0
Project Number:

GENIVAR

Jamie Witherspoon, P.Eng., LEED AP | Director - Municipal Infrastructure
GENIVAR | Constructive People
1-367 Woodlawn Rd. West,Guelph,Ontario,N1H 7K9
T (519) 827-1453 #221 | www.genivar.com
F (519) 827-1483

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non divulgables en vertu de la loi. Si vous n'êtes pas le destinatair= e du présent message ni la personne chargée de remettre le présent message à son destinataire, il vous est strictement interdit de le divulguer, de le distribuer, de le copier ou de l'utiliser de quelque façon que ce soit. Si vous avez reçu la présente communication par erreur, veuillez en aviser l'expéditeur et détruire ou effacer tous les exemplaires que vous avez reçus.

From: Carley Gratrix [mailto:Carley.Gratrix@rjburnside.com]
Sent: Monday, June 13, 2011 10:08 AM
To: Jamie Witherspoon
Subject: York Trunk Sanitary Sewer

Hi Jamie,

Last week Jackie Kay from our office attended the open house for the York Trunk Sewer. I'm just going through the handouts and I'm wondering if you could answer the following questions:

1. The estimated cost of the preferred alternative (Partial Replacement of Existing Sewer and Twining) on Pg 12 is $14.9M. On page 17, the total cost is indicated as $19.4M. Can you please indicate which one is correct?
2. Do you know which sanitary sewers will be twinned?
3. Do you have a schematic showing the proposed changes in size?

Thanks,
Carley

Andrew Tulk

From: Jamie Witherspoon
Sent: Monday, June 13, 2011 12:43 PM
To: Colin.Baker@guelph.ca
Cc: Andrew Tulk; Karen Lenkiewicz
Subject: FW: Open House Notice
Attachments: Incoming.pdf

FYI

No. of Attachments: 0
Project Number:

Jamie Witherspoon, P.Eng., LEED AP | Director - Municipal Infrastructure GENIVAR | Constructive People
1-367 Woodlawn Rd. West,Guelph,Ontario,N1H 7K9 T (519) 827-1453 #221 | www.genivar.com F (519) 827-1483

-----Original Message-----
From: CAU-UCA [mailto:CAU-UCA@ainc-inac.gc.ca]
Sent: Monday, June 13, 2011 9:41 AM
To: Jamie Witherspoon
Subject: Open House Notice

Dear Mr. Witherspoon:

I am writing on behalf of the Consultation and Accommodation Unit (CAU) of Indian and Northern Affairs Canada (INAC). Your letter has been referred to us by (please see attached). The CAU's Consultation Information Service (CIS) has been established to help coordinate departmental responses to consultation-related queries within INAC. The CIS also provides information, primarily to federal officials, related to Aboriginal groups and their Aboriginal and/or treaty rights, to the extent that these are known by INAC.

As a rule, INAC officials do not participate in environmental assessments that pertain to projects off-reserve, nor do we track how other parties carry out their EA or consultation activities where no reserve lands or INAC programs are involved. Therefore, in future, please omit INAC from your public information notifications for projects that do not intersect with reserve lands or engage INAC programs.

Thank you for your assistance in this matter.
Sincerely,

Dale Pegg
Manager
Consultation Information Service

Guelph

OPEN HOUSE NOTICE

York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment

The Study

The City of Guelph has initiated a Class Environmental Assessment study for improvements to the York Trunk Sanitary Sewer and a new drinking water feedermain for the Paisley and Clythe Reservoirs. The Guelph Water and Wastewater Servicing Master Plan (2009) identified the need for these improvements in order to service planned growth in the City.

Second Public Open House

Wednesday, June 8

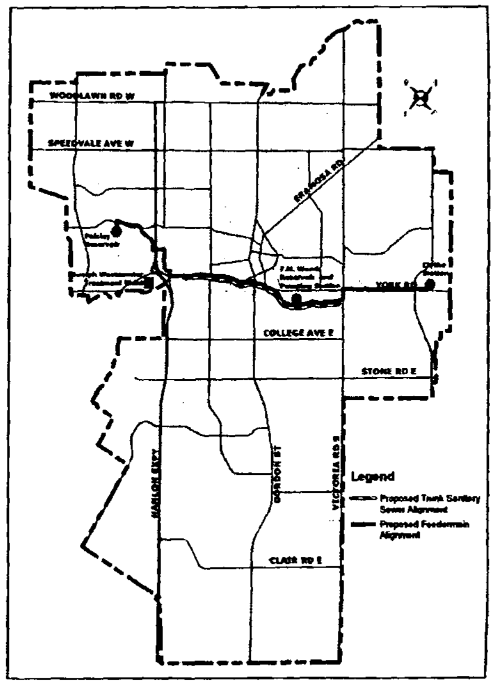
6 - 8 p.m.

Committee Room 112, City Hall, 1 Carden Street

The open house will provide background information on the study, evaluation of various alternatives, and the recommended sewer and feedermain alignments and mitigation measures. Representatives from the City and its consultant will be present to answer questions and discuss the next steps in the project.

About the study

The current York Trunk Sanitary Sewer extends from the former Guelph Reformatory Lands to the Wastewater Treatment Plant west of the Hanlon Expressway along the Eramosa and Speed Rivers.



Recommended Sewer and Feedermain Alignments

This sewer is reaching the end of its useful life and capacity due to a combination of planned population and employment growth in the City and reports of poor condition in sections. A solution is required to replace and/or rehabilitate critical sections of this main trunk sewer.

The Paisley-Clythe Drinking Water Feedermain is a new watermain required to increase the reliability of the supply between the City's F.M. Woods Reservoir and Pumping Station and the Paisley and Clythe Reservoirs located at the west and east ends of the city.

...

As part of the York Trunk Sanitary Sewer and Paisley-Clythe Drinking Water Feedermain Class Environmental Assessment, the City has:

- completed an assessment of existing infrastructure and the environment;
- identified the opportunity/problem and alternative solutions;
- determined the capacity requirements to service existing residents and future growth;
- completed an evaluation of alternatives for routing, construction methods and mitigation measures; and
- identified preliminary recommended alternatives to meet the project objectives for both the sewer and feedermain.

The Process

This study is being planned under Schedule B of the Municipal Class Environmental Assessment process (Municipal Engineers Association, October 2000 as amended in 2007) under Ontario's Environmental Assessment Act. The Class Environmental Assessment process includes public and review agency consultation, an evaluation of alternatives, an assessment of the potential environmental effects of the proposed improvements, and identification of reasonable measures to mitigate any adverse impacts that may result.

Provide your comments

You are encouraged to attend the open house and provide your comments. Those comments will be considered in finalizing the preferred solutions. Comments and information regarding this project will be collected in accordance with the Municipal Freedom of Information and Protection of Privacy Act for the purpose of meeting environmental assessment requirements. With the exception of personal information, all comments will become part of the public record.

For more information

Please contact either of the following project team members if you have any questions or comments, wish to obtain more information regarding the project, or if you would like to be added to the project mailing list:

City of Guelph
Colin Baker, P.Eng.
Environmental Engineer
1 Carden Street
Guelph ON N1H 3A1

T 519-822-1260 x 2282
F 519-822-6194
E colin.baker@guelph.ca

GENIVAR Consultants
James Witherspoon, P. Eng.
Project Engineer
1-367 Woodlawn Road West
Guelph ON N1H 7K9

T 519-827-1453
F 519-827-1483
E jamie.witherspoon@genivar.com

guelph.ca/yorktrunkea

This notice first issued May 26, 2011.

CITY OF Guelph
Making a Difference

York Trunk Sewer & Paisley-Clythe Feedermain Municipal Class Environmental Assessment

The City of Guelph is interested in hearing the community's comments, questions, concerns and suggestions regarding the York Trunk Sewer & Paisley-Clythe Feedermain Class Environmental Assessment. Please take a few minutes to complete this brief comment sheet. All comments will be carefully considered in the Environmental Assessment Process.

1. Do you have any comments related to the **existing environment and key features** in this study area?
   We have a particular interest in the area of the proposed alignment along the Southern boundary of the property located at 40 Wellington Street

2. Do you have any comments, concerns, questions or suggestions regarding the **Environmental Assessment Process or the overall approach** to the Study?
   no

3. Do you have any comments, concerns, questions or suggestions regarding the preferred solutions presented (e.g. water and/or sewer alignments)?
   We would like to know the impact of construction in same area noted above, where development is being proposed – see attached concept plan

4. Do you have any comments, concerns, questions or suggestions regarding the evaluation criteria for the projects?
   no

5. What do you see as the project features of highest interest for the proposed project from the perspective of your organization or as a resident of the area?
   see comments above.

6. Additional comments related to the project.

7. Did you have the opportunity to ask questions, and provide your comments and concerns to the project team? YES / NO

If not, please provide comments as to what issues you would like to further discuss with the project team? Please have your biologist contact me to provide a better understanding of what environmental impacts are likely to occur at 40 Wellington St.

9. Were you able to gain a better understanding of the Study? YES / NO

If not, please provide comments as to what elements of the Study are unclear to you.

10. Please provide any other comments regarding the Public Information Centre

8. How would you describe the nature of your interest in this study?

____ Member of the General Public (including residents and landowners)
____ Member of an Interest Group (Please specify: ____)
X Consultant
____ Agency Representative (Please specify: ____)
X Other (Please specify: property abutting proposed route)

Contact Details

Name: Brent Tegler
Address: 35 Crawford Crescent Unit B45 P.O. Box 518, Campbellville, ON L0P 1B0
Phone Number: 905-854-1112
Email: btegler@nsenvironmental.com

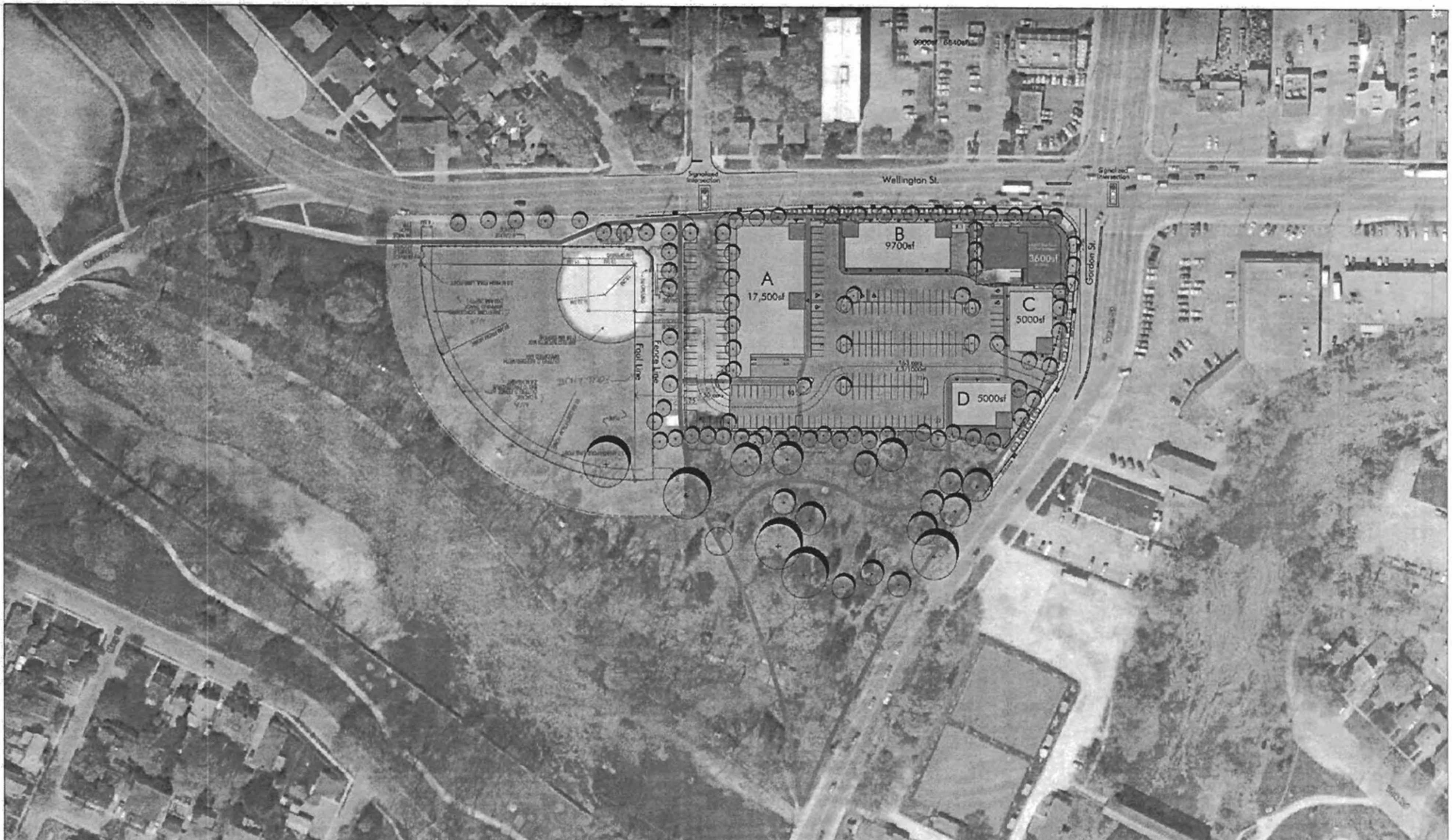
NOTE: Personal information requested on this form is collected in accordance with the Freedom of Information and Privacy Act. All comments will become part of the public record. If you do not wish to have personal information (Name, Address, Telephone, Email) on this comment form in the final report, please check the box below:

( ) Please withhold personal information

Please return this completed Comment Sheet to the project team at the Registration Table or you can fax, email or mail it by June 27th, 2011 to one of the following project contacts:

Colin Baker, P. Eng.
Environmental Engineer
The City of Guelph
City Hall, 1 Carden Street
Guelph, ON N1H 3A1
Phone: 519-822-1260 ext. 2282
Fax:519-837-5640
Email: colin.baker@guelph.ca

James Witherspoon, P.Eng., LEED AP
Project Manager
GENIVAR Inc.
1-367 Woodlawn Road West
Guelph, ON N1H 7K9
Phone: 519-827-1453 ext. 221
Fax: 519-827-1483
Email: jamie.witherspoon@genivar.com



MSAi

Gordon at Wellington Retail Centre
Development Concept
Belmont Equity Partners

Site Context

June 3, 2011

Andrew Tulk

From:	Jamie Witherspoon
Sent:	Tuesday, June 21, 2011 1:23 PM
To:	Colin.Baker@guelph.ca
Cc:	Andrew Tulk
Subject:	Draft Email to Belmont Equity Partners/NS Environmental
Attachments:	10405017_40 WELLINGTON (2)_opt.pdf

COLIN FOR YOUR REVIEW

Dear Mr. Tegler,
Further to your comments from the Public Information Centre held on June 8th, 2011 at City Hall regarding the York Trunk Sewer and Paisley-Clythe Feedermain Project, we are pleased to provide the following response for your review. We would be glad to sit down and review the site with you with the objective of addressing any outstanding concerns you may have.

The preferred alignment for both the York Trunk Sewer and the Paisley Feedermain adjacent to 40 Wellington St. The existing trees that border the property are not considered as significant trees and can be removed to allow for the installation of the works. The configuration of the alignment along the property would be that the 500 mm diameter watermain would be offset approximately 3 m south from the property line, the sanitary sewer would be offset 4 m south of the watermain (see attached sketch). The total disturbed area in this area of the project will be 10-15 m (shown by highlighted area).

Reinstatement in this area would be limited to either grass or naturalized native vegetation due to the potential risk of damage to the underground infrastructure.

Please let me know if you have any additional questions or concerns.

No. of Attachments: 0
Project Number:

GENIVAR

Jamie Witherspoon, P.Eng., LEED AP | Director - Municipal Infrastructure
GENIVAR | Constructive People
1-367 Woodlawn Rd. West,Guelph,Ontario,N1H 7K9
T (519) 827-1453 #221 | www.genivar.com
F (519) 827-1483

Please consider the environment before printing ...

Ministry of Transportation

Operations Office
West Region

659 Exeter Road
London, Ontario N6E 1L3
Telephone: (519) 873-4372
Facsimile: (519) 873-4734

Ministère des Transports

Bureau d'Operations
Région de l'Ouest

659, chemin Exeter
London (Ontario) N6E 1L3
Téléphone: (519) 873-4372
Télécopieur: (519) 873-4734

Ontario

6/28/2011

Dear Sir or Madam:

Re:

The Ministry of Transportation (ministry) controls all encroachments within the provincial highway right-of-way, this includes any installation or other work upon, over or under, or within these limits.

The ministry's control of encroachments is intended to maximize highway safety, maintain the free flow of traffic and minimize the likelihood that an encroachment may interfere with any highway maintenance operations or future reconstruction or expansion of the highway corridor.

All work within the provincial highway right-of-way shall be subject to the approval of the ministry. The approval of encroachments is controlled by issuance of a permit by the ministry under the authority of the *Public Transportation and Highway Act* (section 31). An encroachment permit or any other permit or any approval required by the ministry shall be obtained for each encroachment before any work commences. The following link details the encroachment permit application process:
http://www.mto.gov.on.ca/english/engineering/management/corridor/encroach.shtml

The ministry encourages proponents to contact us during the planning process to discuss specific details of the proposed works, the required permits and the application process.

If you have any questions or require further assistance with the application process, please contact the undersigned.

Yours truly,

Ryan Mentley
Technical Services Officer
Operations Office
West Region

GENIVAR

TELEPHONE CALL RECORD

Project	York Trunk Sewer and Paisley-Clythe Feedermain Class EA	**Project No.**	10405017
Recorded By	Karen Lenkiewicz & Christine Metrie	**Type of Communication**	Phone Call & Attached Email

Stakeholder Contact Information:

Name	Chief Gaetan Sioui	**Phone Number**	418-843-3767 or 418-558-6566
Address	255 Place Chef Michel Laveau	**Organization/Title**	Huron-Wendat First Nation/Chief
City	Wendake	**Province**	Quebec
Postal Code	G0A 4V0	**E-mail Address**	sondaky@videotron.ca

First Point of Contact: February 18th, 2011 by Karen Lenkiewicz

Details of Communication: Talked to Tina Durand who will sent Gaetan an email requesting that he can get back to the project team regarding the sewer and feedermain Class EA study.

Action Taken: Further to Tina's e-mail to Gaetan, the project team sent another email to Gaetan with the Notice of Study Commencement and Notice of Public Information Centre #1 attached, for his reference.

Notes: Nothing further was heard from Gaetan nor anyone else from the Huron Wendat.

Second Point of Contact: May 10th, 2011 by Christine Metrie

Details of Communication: Called at 10 a.m. and reached Geatan's voicemail.

Action Taken: Left a voicemail inquiring whether he had a chance consider whether the Huron Wendat had any interest in the project.

Notes: Nothing further was hear from Gaetan nor anyone else from the Huron Wendat.

Jessica Shantz

From: Karen Lenkiewicz
Sent: Tuesday, February 22, 2011 5:53 PM
To: Tina Durand; Gaetan Sioui
Cc: David Donnelly; Luc Lainé; Heather Bastien; Johanne JC. Couture
Subject: RE: Génivar City of Guelph
Attachments: Notice of PIC #1.pdf; Notice of Study Commencement.pdf

Good evenening Gaetan,

Further to Tina's email, I wanted to clarify that I was contacting you regarding the **York Trunk Sewer and Paisley-Clythe Feedermain Class Environmental Assessment –** a Class B Environmental Assessment for a sewer and a watermain within the City of Guelph. Our project team had previously sent the attached notices regarding the study to Grand Chef Konrad Sioui, but I've since been informed that you are a more appropriate contact.

We are currently in Phase 1 of the project and my reason for contacting you is to see if you have any comments, questions or concerns regarding the project. Please feel free to reach me by email or phone, should you want to discuss any aspect of the project. Alternatively, you may contact either the GENIVAR or the City's project manager (contact information included in the notices).

Best Regards,

GENIVAR

Karen Lenkiewicz, B.E.Sc., B.A. LEED® AP
Infrastructure Management and Planning
GENIVAR | Constructive People
T: 905-475-8727 ext.18242 | www.GENIVAR.com

Please consider the environment before printing.

From: Tina Durand [mailto:Tina.Durand@cnhw.qc.ca]
Sent: February 18, 2011 10:06 AM
To: Gaetan Sioui
Cc: David Donnelly; Luc Lainé; Heather Bastien; Johanne JC. Couture; Karen Lenkiewicz
Subject: Génivar City of Guelph

Allo Gaetan,

Si tu pourrais svp contacter Mme Karen Lenkiewicz de Génivar au 905-475-8727 #18242. Courriel : karen.lenkiewicz@genivar.com

Je lui ai dit que tu étais la personne en charge du dossier Ontarien.

Le sujet : Class environmental assessment of the city of Guelph.

Merci.

Tina

GENIVAR

TELEPHONE CALL RECORD

Project	York Trunk Sewer and Paisley-Clythe Feedermain Class EA	**Project No.**	10405017
Recorded By	Karen Lenkiewicz & Christine Metrie	**Type of Communication**	Phone Call & Attached Email

Stakeholder Contact Information:

Name	Grand Chief Randall Phillips	**Phone Number**	519-434-2761
Address	387 Princess Ave.	**Organization/Title**	Association of Iroquois and Allied Indians/Grand Chief
City	London	**Province**	Ontario
Postal Code	N6V 2A7	**E-mail Address**	rphillips@aiai.on.ca

First Point of Contact: February 18th, 2011 by Karen Lenkiewicz

Details of Communication: Called; however, he was travelling. The secretary recommended email as a more convenient form of communication for the chief.

Action Taken: An email was sent to the Grand Chief with the Notice of Study Commencement and the Notice of Public Information Centre #1 attached, inquiring as to whether he or his organization had any questions, comments or concerns regarding the study.

Notes: No further response was received from the Chief or anyone else from the Association of Iroquois and Allied Indians.

Second Point of Contact: May 10th, 2011 by Christine Metrie

Details of Communication: Talked to Angie at 9:50 a.m.; Grand Chief Randall Phillips was busy and could not take the call.

Action Taken: Confirmed the Chief's mailing address for future notices. Left a voicemail for the Grand Chief with contact information in case the Chief had any questions regarding the study.

Notes: No further response was received from the Chief or anyone else from the Association of Iroquoi and Allied Indians.

Jessica Shantz

From: Karen Lenkiewicz
Sent: Friday, February 11, 2011 12:58 PM
To: rphillips@aiai.on.ca
Subject: York Trunk Sewer and Paisley Clythe Feedermain Class Environmental Assessment in the City of Guelph
Attachments: Notice of Study Commencement.pdf; Notice of PIC #1.pdf

Good afternoon Grand Chief Randall Phillips,

GENIVAR is currently conducting a Class Environmental Assessment on behalf of the City of Guelph for a sewer and watermain in the City of Guelph (the **York Trunk Sewer and Paisley-Clythe Feedermain Class Environmental Assessment**). Last year, we sent you the attached notices regarding the study. Further to sending out these materials, I am following up to confirm whether you have received the notices and if so, if you had any questions or comments regarding the project.

I understand that you are currently travelling quite a bit and out of the office, which is why I have sent you an email. If you have an alternate number at which I can contact you, please let me know. Alternatively, if you have any questions, you can contact myself using the contact information below or either of the project managers (City/GENIVAR) using the contact information provided in the notices attached. Also, to ensure that we are sending our project material to the correct location, please confirm that the address I've listed below is the correct mailing address:

387 Princess Avenue
London, Ontario
N6B 2A7

GENIVAR

Karen Lenkiewicz, B.E.Sc., B.A. LEED® AP
Infrastructure Management and Planning
GENIVAR | Constructive People
T: 905-475-8727 ext.18242 | www.GENIVAR.com

Please consider the environment before printing.

GENIVAR

TELEPHONE CALL RECORD

Project	York Trunk Sewer and Paisley-Clythe Feedermain Class EA	**Project No.**	10405017
Recorded By	Karen Lenkiewicz	**Type of Communication**	Phone Call & Attached Email

Stakeholder Contact Information:

Name	Lonny Bomberry	**Phone Number**	519-753-0665
Address	2498 Chiefswood Road PO Box 5000	**Organization/Title**	Six Nations of the Grand River/ Band Council and Staff
City	Ohsweken	**Province**	Ontario
Postal Code	N0A 1M0	**E-mail Address**	lonnybomberry@sixnations.ca

February 18th, 2011

Details of Communication: Called again with no answer, busy

Notes: Lonny has replied via e-mail stating he does not have any questions regarding the Study.

Jessica Shantz

From: Lonny Bomberry [lonnybomberry@sixnations.ca]
Sent: Tuesday, March 01, 2011 10:11 AM
To: Karen Lenkiewicz
Subject: RE: York Trunk Sewer and Paisley Clythe Feedermain Class EA - In the City of Guelph

Karen: I have no questions. The address you have listed is the correct address.

Lonny C. Bomberry
Director, Lands and Resources
(P): 519-753-0665 ext 12
(F): 519-753-3449
lonnybomberry@sixnations.ca

From: Karen Lenkiewicz [mailto:Karen.Lenkiewicz@genivar.com]
Sent: March 1, 2011 9:43 AM
To: lonnybomberry@sixnation.ca; Lonny Bomberry
Subject: York Trunk Sewer and Paisley Clythe Feedermain Class EA - In the City of Guelph

Good afternoon Mr. Bomberry,

GENIVAR is currently conducting a Class Environmental Assessment on behalf of the City of Guelph for a sewer and watermain in the City of Guelph (the **York Trunk Sewer and Paisley-Clythe Feedermain Class Environmental Assessment**). Last year, we sent you the attached notices regarding the study (attached). Further to sending out these materials, I am following up to confirm whether you have received the notices and if so, if you had any questions or comments regarding the project. I tried calling your office a few times but had troubles connecting – hence the reason for my email.

If you have any questions, you can contact myself using the contact information below or either of the project managers (City/GENIVAR) using the contact information provided in the notices attached. Also, to ensure that we are sending our project material to the correct location, please confirm that the address I've listed below is the correct mailing address:

2498 Chiefswood Road
PO Box 5000
Ohsweken, ON N0A 1M0

Best Regards,

GENIVAR

Karen Lenkiewicz, B.E.Sc., B.A. LEED® AP
Infrastructure Management and Planning
GENIVAR | Constructive People
T: 905-475-8727 ext.18242 | www.GENIVAR.com

Please consider the environment before printing.

GENIVAR

TELEPHONE CALL RECORD

Project	York Trunk Sewer and Paisley-Clythe Feedermain Class EA	**Project No.**	10405017
Recorded By	Karen Lenkiewicz & Christine Metrie	**Type of Communication**	Phone Call

Stakeholder Contact Information:

Name	Ms Margaret Sault	**Phone Number**	905-768-0100
Address	2789 Mississauga Road RR #6	**Organization/Title**	Mississaugas of the New Credit First Nation
City	Hagersville	**Province**	Ontario
Postal Code	N0A 1H0	**E-mail Address**	Not available

First Point of Contact: February 18th, 2011

Details of Communication: No answer

Action Taken: Left a message for Margaret Sault on her answering machine, inquiring whether she had any questions regarding the Notice of Study Commencement and Notice of Public Information Centre #1 that were mailed to her.

Notes: No further response was received from Margaret or anyone else from the Mississaugas of New Credit First Nation.

Second Point of Contact: May 10th, 2011 by Christine Metrie

Details of Communication: Talked to Ms Margaret Sault**,** inquired whether she had any questions regarding the study.

Action Taken: Left her my number and extension, Margaret said she would look at the information that had been mailed to her and call back if she had any questions.

Notes: No further response was received from Margaret or anyone else from the Mississaugas of New Credit First Nation.

GENIVAR

TELEPHONE CALL RECORD

Project	York Trunk Sewer and Paisley-Clythe Feedermain Class EA	**Project No.**	10405017
Recorded By	Karen Lenkiewicz & Christine Metrie	**Type of Communication**	Phone Call

Stakeholder Contact Information:

Name	Paul General	**Phone Number**	519-445-0330
Address	2489 Chiefswood Road PO Box 5000	**Organization/Title**	Six Nations of the Grand River / Wildlife Officer
City	Ohsweken	**Province**	Ontario
Postal Code	N0A 1M0	**E-mail Address**	Not available

First Point of Contact: February 18th, 2011 by Karen Lenkiewicz

Details of Communication: Talked to Doug at the office who said he will tell Paul to get in touch.

Action Taken: None, no response from Paul.

Second Point of Contact: May 10th, 2011 by Christine Metrie

Details of Communication:

- Called Paul and had a chance to speak with him about the project. Asked if he had any questions or comments about the study.
- Paul said he would review the information and call me back in a day or two if he had any questions. He mentioned that he hadn't really looked at any of the project materials and couldn't recall what study was being discussed.

Notes: No further responses were received from Paul nor anyone else at the Six Nations of the Grand River First Nation.

Jamie Witherspoon

From: Jamie Witherspoon
Sent: Wednesday, September 22, 2010 11:37 AM
To: 'dgalon@rogers.com'
Cc: 'Colin.Baker@guelph.ca'
Subject: York Road Trunk Sanitary Sewer - Class EA - Question

Mr. Galon,
Thank-you for your interest in the York Road Trunk Sanitary Sewer. We don't currently have a file on the trunk sewer location that can be emailed readily due to the length of the sewer; however, we will have maps available for viewing during the first public consultation to be held at City Hall in Meeting Room C from 6 pm to 8 pm on October 6th. This will be posted next week on the City Website and also in the Tribune.

With respect to your specific question, the downstream end of the York Road Trunk Sewer starts at the Wastewater Treatment Plant located on the west side of the Hanlon Parkway and North side of the Speed River. It proceeds east under the Hanlon and through Royal City Park (with varying distance from the River, generally closer to Wellington St.) and mostly under grassed areas, crossing the Speed River south to the covered bridge. It continues east though York Road Park and Eramosa River Park, again mostly under grassed areas, but further away from the River until it crosses Victoria Road. It proceeds north on Victoria and turns east immediately north of the industrial plant goes between the plant property and the Plaza property. It then crosses the railroad tracks and turns north, intersecting with Industrial Avenue on York Road and then proceeding on York Road to Beaumont Crescent. It follows Beaumont Crescent around until the road comes back to York Road. It then follows York Road until the City Limits east of Watson Road.

The study is being undertaken to determine the preferred method to maintain current capacity of the sanitary sewer collection system and allow for increased capacity associated with urban development within the City Limits. The existing sewer is quite old and has some age related condition issues that will need to be addressed in upcoming years. In addition to the sewer, this project will also be looking at improving the water supply security of the system by providing an additional water supply main between the main water plant to the Paisley Reservoir (south of Paisley on Ryde Road) and Clythe Reservoir (on the east side of Watson Road, north of York Road).

I trust this meets with your approval. If you have any further questions or would like to be placed on the stakeholder list, please let me know.

Regards,
James

No. of Attachments: 0
Project Number:

GENIVAR

Jamie Witherspoon, P.Eng., LEED AP | Director - Municipal Infrastructure
GENIVAR | Constructive People
1-367 Woodlawn Rd. West,Guelph,Ontario,N1H 7K9
T (519) 827-1453 #221 | www.genivar.com
F (519) 827-1483

Please consider the environment before printing ...

York Trunk Sewer and Paisley-Clythe Feedermain Municipal Class Environmental Assessment

GENIVAR Project No. 10405017

October 19, 2011

Technical Memorandum - Energy Capture

1-367 Woodlawn Rd. W., Guelph, Ontario N1H 7K9
Telephone: 519.827.1453 • Fax: 519.827.1483 • www.genivar.com
Contact: James Witherspoon, P.Eng., LEED AP, Director - Municipal Infrastructure • E-mail: Jamie.Witherspoon@genivar.com

GENIVAR

Project No.

1045017/111-55820-00

Colin Baker
City of Guelph
City Hall, 1 Carden Street
Guelph, ON N1H 3A1

Re: York Trunk Sanitary Sewer and Paisley-Clythe Feedermain
Technical Memorandum - Energy Capture

Dear Colin:

GENIVAR Inc. is pleased to submit the draft Energy Capture Technical Memorandum as a supporting deliverable for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Class Environmental Assessment Project.

This report is intended to assess the feasibility of an Energy Capture system in conjunction with the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain implementation.

We trust this report meets with your approval. If you have any questions or comments please don't hesitate to contact the undersigned at (519) 827-1453.

Yours truly,
GENIVAR Inc.

Jamie Witherspoon, P.Eng., LEED AP
Project Manager

1-367 Woodlawn Road West, Guelph, Ontario
Telephone: 519.827.1453 • Fax: 519.827.1483 • www.genivar.com

Table of Contents

List of Tables and Figures

1. Introduction

Renewable energy sources are a growing industry, due to lack of confidence in the supply of fossil fuels and the emission of carbon into the atmosphere from combustion of fossil fuels. Industries are looking for a more sustainable way to operate their facilities and reduce energy demands. In 2007, the City of Guelph approved a Community Energy Plan with the purpose of net energy use reductions within the City, in an effort to work toward a sustainable future. In 2008 the city of Guelph, in partnership with Guelph Hydro, installed a cogeneration system at the Guelph WWTP. This cogeneration station utilizes methane created within the digester of the plant to power a turbine which creates electrical and heat energy. The electricity is used throughout the WWTP and the heat is used to supplement the heating requirements of the digester.

As part of the scope for the York Trunk Sewer and Paisley-Clythe Feedermain Class Environmental Assessment, there was a request to assess opportunities for energy capture with the new upgraded sanitary sewer. There is the potential of extracting available waste heat or energy from the sewage entering the facility and this technical memorandum is intended to review and assess that potential.

2. Background

The science of energy capture associated with wastewater collection systems can be achieved by two primary manners, heat capture or kinetic energy capture.

There is potential to extract waste heat from any medium (liquid, gas, solid) that has a higher temperature than ambient air. The higher temperature medium, in this case raw sewage, is called in heat source while the substance that is being used to extract the heat is the heat sink. The quantity of energy available for capture is dependant on the temperature gradient between the heat source and the heat sink.

Kinetic energy capture is where the physical energy of the wastewater as measured by velocity and momentum is captured and changed into electrical energy via a turbine system similar to a hydroelectric dam. Due to the particulate in raw sewage and the low slope of the inlet sewers to the Guelph WWTP, this option is not feasible and will not be reviewed in detail in this memorandum.

This report will focus on the possibility of collecting heat energy from wastewater.

2.1 Energy Capture Process

This source has a lower temperature than typical waste heat sources that are often used for heat capture, such as steam or oven exhaust, classifying this system as a low temperature heat capture system.

Low temperature heat capture systems are comprised of two important components:

1) Capture of heat from source; and,

2) Upgrading of heat energy;.

This section outlines the basic principals and common technologies utilized in each of the identified sections.

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The capture of heat is the initial phase of the process, this is accomplished by the transfer of energy contained within the wastewater to a fluid called the 'working fluid'. This transfer of energy is facilitated by the zeroth and first laws of thermodynamics, stating that two compounds in contact eventually reach the same equilibrium temperature and that energy is conserved within a system.

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The heat exchanger configurations vary depending on the application requirements. The configurations consist of a combination of flow patterns between the working fluid and the heat source and arrangements of the heat transfer surfaces. Two common flow patterns and two popular arrangements are outlined below.

2.1.1.1 Direction of Flow through Heat Exchanger

There are two different ways the working fluid and heat source can flow through the heat exchanger to enable conduction to occur. This section describes both Parallel and Counter-current flow patterns.

Parallel Flow

Parallel flow describes when the two fluids enter the exchanger at the same end and travel in parallel to the other side of the exchanger. This results in the highest temperature of the system being in contact with the coldest temperature of the system until they are the same temperature at the end of the system. The effectiveness of this type of heat exchangers is dependant on the contact time between the two fluids, if it is too short, the system does not collect all of the available energy.

Counter-current Flow

Counter-current flow heat exchangers have the two fluids entering the heat exchanger at opposite ends of the system with opposite direction of flow. This type of flow is highly efficient as it is able transfer the most heat from one fluid to the other. As such, going forward in the discussion, the counter-current flow heat exchanger will be discussed and utilized in design calculations as the preferred technology.

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The orientation the working fluid has with the heat source can vary, depending on the application. This section describes the two most common heat exchanger arrangements.

Shell and tube Arrangement

Shell and tube heat exchanger use a series of tubes within a container (the shell) to facilitate the transfer of energy from the heat source to the working fluid. One fluid flows through the tubes, while the other flows around the tubes. Shell and tube heat exchangers are generally more expensive due to the materials and labour required to construct them. These systems are generally more robust than other designs and can be less susceptible to fouling depending on the spacing between the pipes.

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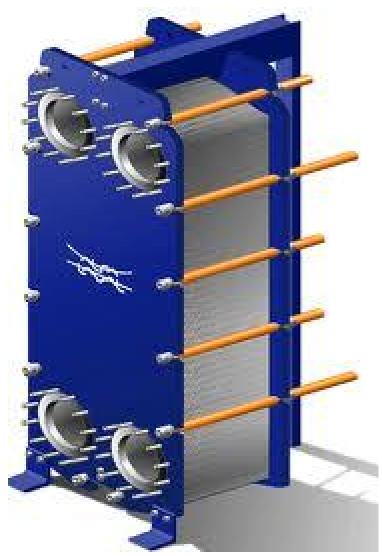

Figure 2-1: Typical Plate Heat Exchanger

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Heat pumps use a vapour-compression cycle, **outlined in Figure 2-1**, to transfer heat from a low-grade source (wastewater) to a higher-grade source (hot water). A heat pump uses an intermediate refrigerant, the working fluid, which absorbs heat as it vaporizes and releases the heat when it is condensed. A reversing valve allows for the flow direction of the refrigerant to be changed. Heat pumps are able to heat a fluid using;

- A relatively small temperature gradient;
- Thermodynamic vapour-compression cycle; and,
- A small amount of electric power or work input.

The vapour-compression cycle is shown in **Figure 2-1**, the cycle is based on two properties of a mass,

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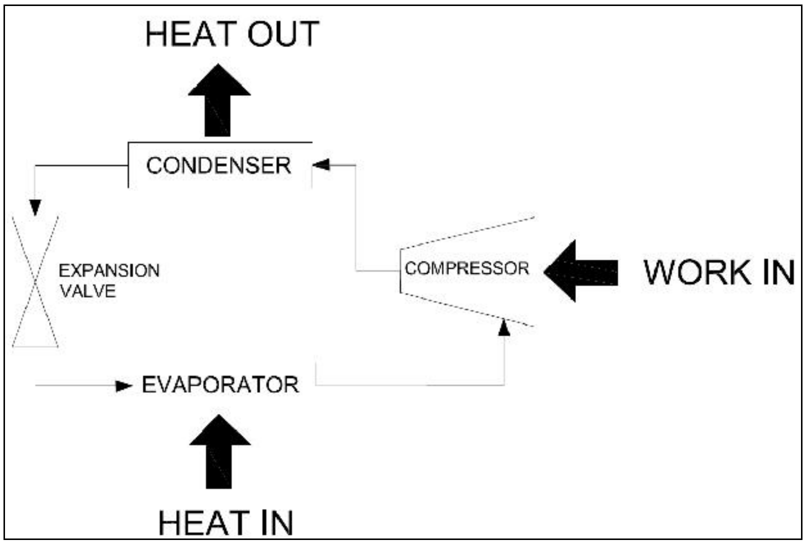

Figure 2-2: Vapour-Compression Cycle

A heat pump uses the working fluid of the closed system to absorb heat as it evaporates and release the heat when it is compressed. The system accomplishes this change of phase by the work supplied by a relatively small electric pump and the changes in diameter of the compression system.

With a high-efficiency heat pump, it is possible to output more than four times as much heat energy as the amount of electrical energy inputted. The heat pump is a vital component to this heat capture system as it transfers the low quality heat energy collected by the heat exchanger into a higher grade of energy while using a limited amount of input energy.

2.1.2.2 Natural Gas Burner

In some applications a natural gas boiler is used to upgrade the heat level within the working fluid. The use of a natural gas burner is a more economical way to create a useful amount of heat energy within the working fluid, since the capital cost are considerably lower than those associated with a heat pump. If the goal of the system is to limit the use of fossil fuels, then this method of heat upgrade is not a feasible option.

2.2 Previous Implementations

2.2.1 Tokyo, Japan - Sony Corporation's Headquarters

Completed in October 2006, the building uses a high-efficiency heating and cooling system. The system makes efficient use of waste heat from treated sewage water from a wastewater treatment plant in close proximity to the building. The system uses large water holding tanks and a battery with an output capacity of 2.5MW to store energy in times of low demand. There is limited technical information for this system, however; the reported average coefficient of performance (ratio of heat output to the supplied work) for this heating and cooling system in the year after commissioning was 5.19, meaning the system produces over 5 times the heat energy supplied to it. It was also reported that the high construction cost of a facility to use sewage water is a hurdle for potential users.

2.2.2 Colorado, USA – Snow Melt System

Waste heat captured from the WWTP was used for snow melting purposes along pedestrian walkways in a skiing community. The plant discharges 8400 m^3/d at an average temperature of 15^oC into a local river. A heat-pump system, powered by wind-generated electricity was used to transfer waste heat to coolant fluid in a closed loop. The closed-loop heating system used glycol filled double walled heating tubes at a flow rate of 66 Lps to transfer heat to the snow melting locations. The thermostat on the heat pump was connected to the glycol temperature measurement system. The system was designed to deliver up to approximately 3000 KW-thermal from the effluent, this could de-ice an area of approximately 7,000 m^2 of walkway.

Cost estimated for main components of this system are outlined in **Table 2-1**.

Table 2-1: Estimated cost for heat pump system components

Component	Cost (Converted from 2008 US$ to 2010 CAN$)
Three - Heat pumps	$198,000
Three – Glycol Pumps (@1,325 Lpm)	$132,000
Three – WW Effluent Pumps (@1,325 Lpm)	$99,000
1035 lm of 12mm PVC pipe	$448,800
Operation/year	$385,000

2.2.3 Vancouver, Canada – False Creek Energy Centre

In preparation for the 2010 Olympic Winter Games, the City of Vancouver constructed the first community energy system in North America that uses heat recovered from raw sewage. The plant uses water as the working fluid to collect heat from raw sewage and distribute it to the condominiums in the area. The raw sewage is screened to remove solids prior to being pumped through the shell-and-tube heat exchanger. To prevent fouling of the heat exchange surfaces the system was design with a self-cleaning device to prevent particulate in the liquid from creating a bio-film build up and impeding heat transfer. The heat transferred to the working fluid is upgraded by the heat pump and distributed to local buildings via heavily insulated piping. The system provides 70% of the annual energy requirements of the buildings containing over 560,000 m^2 of floor space, with the reminder energy requirements supplemented with solar and natural gas energies.

3. Discussion

Since the temperatures of the treated and raw wastewater are reported to be similar, this report will focus on the extraction of energy from the WWTP effluent (treated sewage). The use of treated effluent limits the potential for clogging of the heat capture equipment by the coagulation of fats, oil or greases, allowing for improved performance of the equipment. This will also limit the maintenance requirements of the system while increasing the lifespan and performance of the system. Furthermore, one of the identified concerns with heat capture from the raw influent would be the adverse impact on the biological process of the activated sludge system during the winter. Lowering the influent temperature would likely reduce the treatment efficiency of the plant and result in higher operational costs.

Using treated effluent will also further lower the temperature of water entering the Speed River in the summer months, which is beneficial to local aquatic habitats. This study will evaluate the use of a heat exchanger in conjunction with a heat pump to utilize the temperature gradient between wastewater effluent and ambient air for various purposes such as space heating and cooling, snow melting and water heating at the WWTP location.

3.1 Guelph Effluent

The City of Guelph WWTP discharges approximately 54,000m^3/d into the Speed River. The effluent temperature varies from 12^{o}C in the winter to 20^{o}C in the summer. **Table 3-1** summarizes the WWTP effluent parameters relevant to the operation of this system, such as pH, dissolved oxygen (DO), total suspended solids (TSS) and total dissolved solids (TDS). The pH of the effluent is important avoid corrosion issues in the system. The levels are fairly consistent at 7.8, meaning that the effluent is neutral/very slightly basic. TSS and TDS are parameters that relate to the potential for build up of contaminants within the pipe work of the system. The temperature of the effluent and the amount of DO within the effluent may affect the health of aquatic habitat the effluent is being discharged to. Dissolved Oxygen levels are important to sustain aquatic life, high DO levels are a contributing factor of nitrification, causing the collapse of local aquatic ecosystems. As seen in **Table 3-1** the DO levels are dependent on the temperature of the effluent. This is due to the physical properties of water, allowing more oxygen to be dissolved at higher temperatures. The reduced temperatures of effluent resulting from this system, therefore, could contribute to a healthier local aquatic habitat.

Table 3-1: City of Guelph Wastewater Quality Data - 2010

Average Month	pH	Temp (^{o}C)	Dissolved Oxygen mg/L (2011)	Total Suspended Solids mg/L	Total Dissolved Solids mg/L (2002)
January	7.7	12.9	8.8	2	1295.6
February	7.8	12.7	8.9	2	1331.5
March	7.7	12.7	9.4	3	1318.5
April	7.8	14.6	9.5	2	1231.2
May	7.8	16.6	9.2	2	1217.0
June	7.8	18.3	9.0	2	1222.5
July	7.9	20.5	9.1	2	1234.8
August	8.0	21.6	8.4	2	1301.2
September	7.9	20.9	n/a	2	1291.3
October	7.8	19.1	n/a	2	1313.2
November	7.9	17.2	n/a	2	1259.5
December	7.8	14.7	n/a	2	1271.5
Annual Average	**7.8**	**16.8**	**9.0**	**2.1**	**1274.0**

3.2 Opportunities

This report focus on uses found at the Guelph WWTP since this would be the simplest initial application of the waste energy collected from the effluent. There is potential for this technology to be extended to community heating & cooling in the future, but the efficiency of the overall system decreases with increased distance from the heat source. It is important that the energy capture system be utilized throughout the year to achieve a realistic pay back period.

The site contains a four train water treatment plant with maintenance building (975m^2), chemical storage building (100m^2) and administrative building (450m^2). The site is also the location of the Guelph Humane Society building (550m^2). Through this report the potential for heating and cooling these buildings, a combined area of over 2,000m^2 will be discussed.

The opportunities discussed in this section will be those that utilize hot water for heating purposes, as there would be a significant energy and capital investments to create a system that converts the heat recovered into mechanical or electrical energy.

3.2.1 Water Heating

The energy collected could be utilized as a primary step to initially warm the water before the existing water heater. This would effectively lower the fuel requirements to maintain the current heating level. Heated water demand for the buildings on site (administrative building and the humane society building) are likely to be minimal, and would not constitute the expense of the require capital cost for the heat capture system. Due to low demands of this use, it is not feasible for this to be a primary use of any heat capture system, but could be a side stream as appropriate.

3.2.2 Snow Melting

On site snow melting is an excellent application during the winter months, using hot water through in-ground tubing to melt ice and snow on the surface. This system would limit the health and safety risks associated with a build up of snow and ice, without the application of salt or sand to the site. This system would be installed similarly to a radiant floor heating system in a home, requiring the entire site to be resurfaced when installed. While this is a good use for the heat recovered from the effluent, it is only required during four months of the year in southern Ontario, this fact could negatively affect the fiscal feasibility of this captured heating option.

There would be significant capital cost associated with the implementation of this alternative if it were completed independently to other projects. In coordination with a plant upgrade where significant road works are planned, this would be a feasible option, but independently, the costs would be reasonable for the benefit. Alternatively, the pathways around the facility could be completed at a lower cost and this may be feasible due to the high cost of snow removal on smaller areas compared with parking lots and the associated labour. Again, if coordinated with other works, it may be feasible, but independently it would not be.

3.2.3 Heating for Biosolids Digester

Currently, the anaerobic digester the Guelph WWTP operates at the Mesophilic temperature of 35-37^{o}C. The emissions from this digestion contain 65% methane which is used in co-generation engines on site for electrical generation, building heating and heating of digestion tank. The co-generation system currently supplements the energy requirements previously mentioned. There is potential for the effluent heat recovery system to further supplement the heating of the digestion tanks; however, since there is already a system in place, the feasibility of this alternative is minimal.

3.2.4 Space Heating & Cooling

The heat capture system would be utilized within local buildings such as the WWTP administrative offices or the Guelph Humane society for climate control. The use of a radiant floor heating system would allow for heating and cooling of these buildings using the same system, controls will have to be installed to ensure that water pumped through the system for cooling are not below the dew point, creating condensation on the cooling surface. On average, 51% of energy usage by commercial offices is used for heating (Natural Resources Canada, 2008); this option could represent a significant energy savings. However, considering that the WWTP already utilizes the co-generation facility for some space heating, the savings would be reduced and in general, with the exception of office spaces, WWTP facilities are not heated to the same temperature as office buildings and therefore the cost savings may not be equivalent.

Furthermore, the installation of radiant heating systems would not be feasible within existing buildings independent of another project.

3.3 System Components

The two main system components discussed in this section are a heat exchanger to capture the heat from the effluent and a heat pump to upgrade the heat so it can be utilized in applications on site. The design specifications for both of these systems are in ***Appendix A*** and ***Appendix B***. The heat exchanger and the heat pump would be connected together in a closed system, with the working fluid flowing though the closed system.

3.3.1 Heat Exchanger

The type of heat exchanger selected for further discussion within this report is a counter-current flow, wide gap plate arrangement. This is the most effective and applicable type of heat exchanger for the application due to the ability of the system to be regularly cleaned and inspected to avoid fouling from contaminant build-up. Furthermore, the efficiency to floor area ratio is significantly higher than a shell and tube system which would required significant area for a low temperature gradient system. The following sections outline the basic operation principles and design specifications of this exchanger.

3.3.1.1 Heat Exchanger Specifications

Appendix A includes the design specification for a heat exchanger sized to utilize all of the effluent leaving the plant. This is a fluid to fluid heat energy transfer system comprised of 2 separate exchangers, each 4.6m x 1.2m x 3.2m in size, connected in parallel. It would be ideal that this system be installed indoors to avoid the effluent freezing with the system during extreme weather conditions, potentially requiring the construction of a dedicated building. In order to avoid having to pump the effluent, the heat exchanger would need to be installed below the hydraulic gradeline for the effluent which would likely be an underground gallery. This would have a significant impact on cost and feasibility; otherwise pumping of the effluent would be required at an additional cost.

An Ethylene Glycol mixture was selected for the thermal working fluid (the fluid that absorbs the heat from the effluent) in the event that below freezing outdoor air is required for the air intake of the system. The selected exchanger collects heat energy from the WWTP effluent, lowering its temperature by approximately 10^{o}C. The cooled effluent is then released into the Speed River.

3.3.2 Heat Pump

The heat pump was selected to upgrade the heat energy due to its sustainability compared to the natural gas boiler. The specifications of the selected heat pump are outlined in this section.

3.3.2.1 Potential Implementation Example

It is estimated that there was potential for 10 500 kW of heating potential if all of the WWTP effluent were utilized through a heat exchanger, were to be utilized. For the purposes of this report, however, the system was design based on the heating and cooling requirements of the building located on site. The estimated heating and cooing load for the buildings on site are outlined in **Table 3-2**, Building Type One includes buildings that are assumed to require more heating/cooling such as the administrative building, Humane Society building (for feasibility purposes only) and the chemical storage building. Building Type Two is the maintenance building, which was assumed to not require the same level of climate control. Based on these demands the heat pump size was determined. This assessment is for comparative purposes only as the detailed design of the system is beyond the scope of this project.

Table 3-2: Heating and cooling Load estimation based on area.

	Area (m^2)	HeatingLoad/m^2	Estimated Heating load (kWh)
Building Type One	1100	0.16 kWh	175
Building Type Two	975	0.1 kWh	92

The heat pump system contains two units with the capacity of 175 kW, to provide redundancy within the system. This allows the site to rely on the heat capture system as primary sources for climate control.

3.4 Costs Analysis

The estimated cost to capture all of the potential heat from the wastewater would be approximately $1.5 to $2.0 million and could conceivably provide 10,500 kWh of heat energy to the facility. Currently, there are no adjacent demands that could utilize that heat and the cost would not warrant the benefit.

Considering the actual potential demand of the 267 kWh for building heating purposes, a smaller system would be appropriate. The estimated cost of this system would be in the $100,000 – $200,000 range. The system would be scalable to meet the required demands for the use. The cost savings in comparison between a standard natural gas system versus a heat pump system typically have a 12 year payback period and a longer overall system lifespan, which makes them feasible for new installations. Due to the addition of the heat exchange system, which is not part of a conventional ground source heat pump system, this would extend the payback period even further and as a retrofit project, it would not be economically feasible.

3.5 Sustainability

Although the system is not economically feasible as a retrofit option, there are significant sustainability advantages associated with recovery of heat from the wastewater as an alternative to gas, electric or oil heating. The estimated greenhouse gas emissions savings associated with heating the existing buildings with heat recovered through the wastewater is 138 Tonnes/year in comparison with natural gas heating.

From an environmental sustainability standpoint, heat recovery from wastewater is preferred over other standard heating methods.

3.6 Limitations

The following represent the limitations on the energy capture system:

- The system is primarily dependent on a use for the heat. The development of a heat capture system in isolation will not be effective without a use for the heat and the development of the use may cost a similar cost to the cost of capturing the heat.
- The available uses for heat are typically highest during the period where the effluent is the coldest and therefore the cost of the system increases to increase the efficiency by extracting more heat out of colder water in order to meet the heat demands.
- The effluent quality with respect to TDS will require a higher quality of heat exchange system to prevent corrosion.
- There will be operation and maintenance costs associated with the system and although the heat is essentially available at no cost, the collection will result in a significant cost and operational requirements.
- The evaluations contained herein are based on maximum efficiency of the system. Heat pump systems are known for having some inconsistencies with achieving maximum efficiency in the field. Therefore, in any detailed evaluation of the options, this should be considered.

4. Conclusions and Recommendations

The heat capture from the wastewater effluent at the Guelph WWTP is technically feasible; however, without a defined use of adequate size to warrant the expense, it is not economically feasible as a stand-alone project.

There is a distinct sustainability advantage in terms of reduced greenhouse gas emissions to heat capture from wastewater provided that the economics and use can be achieved in a practical manner.

In the future with the development and expansion of the plant, it may be economically feasible to include an energy capture system as part of the expansion or as part of the proposed technology centre at the plant in the upcoming years. This would be a pilot program to illustrate and investigate the best methods to increase the sustainability of the facility.

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York Trunk Sewer and Paisley-Clythe Feedermain Municipal Class Environmental Assessment

GENIVAR Project No. 10405017

October 19, 2011

Technical Memorandum - Energy Capture

GENIVAR




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GENIVAR

Project No.

1045017/111-55820-00

Colin Baker
City of Guelph
City Hall, 1 Carden Street
Guelph, ON N1H 3A1

Re: York Trunk Sanitary Sewer and Paisley-Clythe Feedermain
Technical Memorandum - Energy Capture

Dear Colin:

GENIVAR Inc. is pleased to submit the draft Energy Capture Technical Memorandum as a supporting deliverable for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Class Environmental Assessment Project.

This report is intended to assess the feasibility of an Energy Capture system in conjunction with the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain implementation.

We trust this report meets with your approval. If you have any questions or comments please don't hesitate to contact the undersigned at (519) 827-1453.

Yours truly,
GENIVAR Inc.

Jamie Witherspoon, P.Eng., LEED AP
Project Manager

Table of Contents

List of Tables and Figures

1. Introduction

Renewable energy sources are a growing industry, due to lack of confidence in the supply of fossil fuels and the emission of carbon into the atmosphere from combustion of fossil fuels. Industries are looking for a more sustainable way to operate their facilities and reduce energy demands. In 2007, the City of Guelph approved a Community Energy Plan with the purpose of net energy use reductions within the City, in an effort to work toward a sustainable future. In 2008 the city of Guelph, in partnership with Guelph Hydro, installed a cogeneration system at the Guelph WWTP. This cogeneration station utilizes methane created within the digester of the plant to power a turbine which creates electrical and heat energy. The electricity is used throughout the WWTP and the heat is used to supplement the heating requirements of the digester.

As part of the scope for the York Trunk Sewer and Paisley-Clythe Feedermain Class Environmental Assessment, there was a request to assess opportunities for energy capture with the new upgraded sanitary sewer. There is the potential of extracting available waste heat or energy from the sewage entering the facility and this technical memorandum is intended to review and assess that potential.

2. Background

The science of energy capture associated with wastewater collection systems can be achieved by two primary manners, heat capture or kinetic energy capture.

There is potential to extract waste heat from any medium (liquid, gas, solid) that has a higher temperature than ambient air. The higher temperature medium, in this case raw sewage, is called in heat source while the substance that is being used to extract the heat is the heat sink. The quantity of energy available for capture is dependant on the temperature gradient between the heat source and the heat sink.

Kinetic energy capture is where the physical energy of the wastewater as measured by velocity and momentum is captured and changed into electrical energy via a turbine system similar to a hydroelectric dam. Due to the particulate in raw sewage and the low slope of the inlet sewers to the Guelph WWTP, this option is not feasible and will not be reviewed in detail in this memorandum.

This report will focus on the possibility of collecting heat energy from wastewater.

2.1 Energy Capture Process

This source has a lower temperature than typical waste heat sources that are often used for heat capture, such as steam or oven exhaust, classifying this system as a low temperature heat capture system.

Low temperature heat capture systems are comprised of two important components:

1) Capture of heat from source; and,
2) Upgrading of heat energy;.

This section outlines the basic principals and common technologies utilized in each of the identified sections.

2.1.1 Method of Heat Capture – Heat Exchangers

The capture of heat is the initial phase of the process, this is accomplished by the transfer of energy contained within the wastewater to a fluid called the 'working fluid'. This transfer of energy is facilitated by the zeroth and first laws of thermodynamics, stating that two compounds in contact eventually reach the same equilibrium temperature and that energy is conserved within a system.

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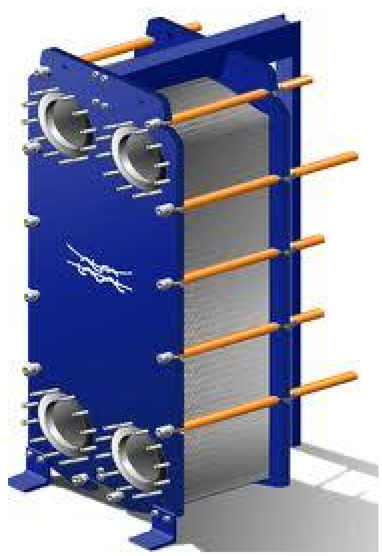

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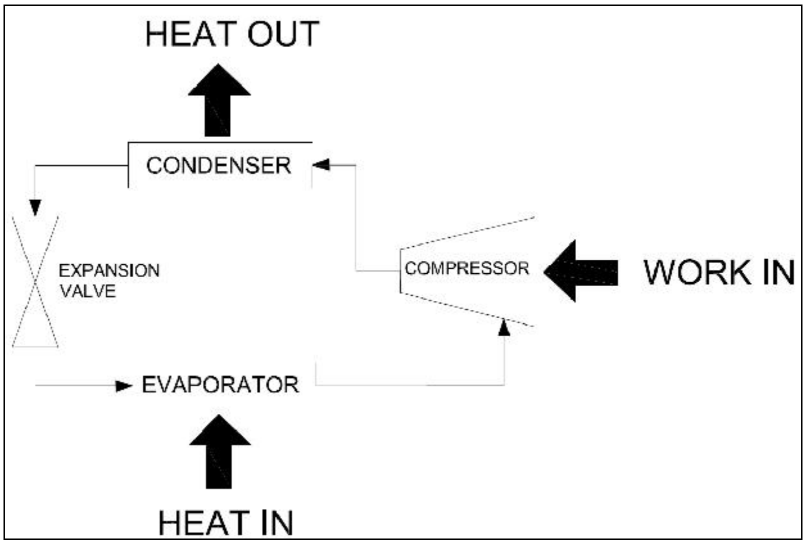

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With a high-efficiency heat pump, it is possible to output more than four times as much heat energy as the amount of electrical energy inputted. The heat pump is a vital component to this heat capture system as it transfers the low quality heat energy collected by the heat exchanger into a higher grade of energy while using a limited amount of input energy.

2.1.2.2 Natural Gas Burner

In some applications a natural gas boiler is used to upgrade the heat level within the working fluid. The use of a natural gas burner is a more economical way to create a useful amount of heat energy within the working fluid, since the capital cost are considerably lower than those associated with a heat pump. If the goal of the system is to limit the use of fossil fuels, then this method of heat upgrade is not a feasible option.

2.2 Previous Implementations

2.2.1 Tokyo, Japan - Sony Corporation's Headquarters

Completed in October 2006, the building uses a high-efficiency heating and cooling system. The system makes efficient use of waste heat from treated sewage water from a wastewater treatment plant in close proximity to the building. The system uses large water holding tanks and a battery with an output capacity of 2.5MW to store energy in times of low demand. There is limited technical information for this system, however; the reported average coefficient of performance (ratio of heat output to the supplied work) for this heating and cooling system in the year after commissioning was 5.19, meaning the system produces over 5 times the heat energy supplied to it. It was also reported that the high construction cost of a facility to use sewage water is a hurdle for potential users.

2.2.2 Colorado, USA – Snow Melt System

Waste heat captured from the WWTP was used for snow melting purposes along pedestrian walkways in a skiing community. The plant discharges 8400 m^3/d at an average temperature of 15^oC into a local river. A heat-pump system, powered by wind-generated electricity was used to transfer waste heat to coolant fluid in a closed loop. The closed-loop heating system used glycol filled double walled heating tubes at a flow rate of 66 Lps to transfer heat to the snow melting locations. The thermostat on the heat pump was connected to the glycol temperature measurement system. The system was designed to deliver up to approximately 3000 KW-thermal from the effluent, this could de-ice an area of approximately 7,000 m^2 of walkway.

Cost estimated for main components of this system are outlined in **Table 2-1**.

Table 2-1: Estimated cost for heat pump system components

Component	Cost (Converted from 2008 US$ to 2010 CAN$)
Three - Heat pumps	$198,000
Three – Glycol Pumps (@1,325 Lpm)	$132,000
Three – WW Effluent Pumps (@1,325 Lpm)	$99,000
1035 lm of 12mm PVC pipe	$448,800
Operation/year	$385,000

2.2.3 Vancouver, Canada – False Creek Energy Centre

In preparation for the 2010 Olympic Winter Games, the City of Vancouver constructed the first community energy system in North America that uses heat recovered from raw sewage. The plant uses water as the working fluid to collect heat from raw sewage and distribute it to the condominiums in the area. The raw sewage is screened to remove solids prior to being pumped through the shell-and-tube heat exchanger. To prevent fouling of the heat exchange surfaces the system was design with a self-cleaning device to prevent particulate in the liquid from creating a bio-film build up and impeding heat transfer. The heat transferred to the working fluid is upgraded by the heat pump and distributed to local buildings via heavily insulated piping. The system provides 70% of the annual energy requirements of the buildings containing over 560,000 m^2 of floor space, with the reminder energy requirements supplemented with solar and natural gas energies.

3. Discussion

Since the temperatures of the treated and raw wastewater are reported to be similar, this report will focus on the extraction of energy from the WWTP effluent (treated sewage). The use of treated effluent limits the potential for clogging of the heat capture equipment by the coagulation of fats, oil or greases, allowing for improved performance of the equipment. This will also limit the maintenance requirements of the system while increasing the lifespan and performance of the system. Furthermore, one of the identified concerns with heat capture from the raw influent would be the adverse impact on the biological process of the activated sludge system during the winter. Lowering the influent temperature would likely reduce the treatment efficiency of the plant and result in higher operational costs.

Using treated effluent will also further lower the temperature of water entering the Speed River in the summer months, which is beneficial to local aquatic habitats. This study will evaluate the use of a heat exchanger in conjunction with a heat pump to utilize the temperature gradient between wastewater effluent and ambient air for various purposes such as space heating and cooling, snow melting and water heating at the WWTP location.

3.1 Guelph Effluent

The City of Guelph WWTP discharges approximately 54,000m^3/d into the Speed River. The effluent temperature varies from 12^{o}C in the winter to 20^{o}C in the summer. **Table 3-1** summarizes the WWTP effluent parameters relevant to the operation of this system, such as pH, dissolved oxygen (DO), total suspended solids (TSS) and total dissolved solids (TDS). The pH of the effluent is important avoid corrosion issues in the system. The levels are fairly consistent at 7.8, meaning that the effluent is neutral/very slightly basic. TSS and TDS are parameters that relate to the potential for build up of contaminants within the pipe work of the system. The temperature of the effluent and the amount of DO within the effluent may affect the health of aquatic habitat the effluent is being discharged to. Dissolved Oxygen levels are important to sustain aquatic life, high DO levels are a contributing factor of nitrification, causing the collapse of local aquatic ecosystems. As seen in **Table 3-1** the DO levels are dependent on the temperature of the effluent. This is due to the physical properties of water, allowing more oxygen to be dissolved at higher temperatures. The reduced temperatures of effluent resulting from this system, therefore, could contribute to a healthier local aquatic habitat.

Table 3-1: City of Guelph Wastewater Quality Data - 2010

Average Month	pH	Temp (^{o}C)	Dissolved Oxygen mg/L (2011)	Total Suspended Solids mg/L	Total Dissolved Solids mg/L (2002)
January	7.7	12.9	8.8	2	1295.6
February	7.8	12.7	8.9	2	1331.5
March	7.7	12.7	9.4	3	1318.5
April	7.8	14.6	9.5	2	1231.2
May	7.8	16.6	9.2	2	1217.0
June	7.8	18.3	9.0	2	1222.5
July	7.9	20.5	9.1	2	1234.8
August	8.0	21.6	8.4	2	1301.2
September	7.9	20.9	n/a	2	1291.3
October	7.8	19.1	n/a	2	1313.2
November	7.9	17.2	n/a	2	1259.5
December	7.8	14.7	n/a	2	1271.5
Annual Average	**7.8**	**16.8**	**9.0**	**2.1**	**1274.0**

3.2 Opportunities

This report focus on uses found at the Guelph WWTP since this would be the simplest initial application of the waste energy collected from the effluent. There is potential for this technology to be extended to community heating & cooling in the future, but the efficiency of the overall system decreases with increased distance from the heat source. It is important that the energy capture system be utilized throughout the year to achieve a realistic pay back period.

The site contains a four train water treatment plant with maintenance building (975m^2), chemical storage building (100m^2) and administrative building (450m^2). The site is also the location of the Guelph Humane Society building (550m^2). Through this report the potential for heating and cooling these buildings, a combined area of over 2,000m^2 will be discussed.

The opportunities discussed in this section will be those that utilize hot water for heating purposes, as there would be a significant energy and capital investments to create a system that converts the heat recovered into mechanical or electrical energy.

3.2.1 Water Heating

The energy collected could be utilized as a primary step to initially warm the water before the existing water heater. This would effectively lower the fuel requirements to maintain the current heating level. Heated water demand for the buildings on site (administrative building and the humane society building) are likely to be minimal, and would not constitute the expense of the require capital cost for the heat capture system. Due to low demands of this use, it is not feasible for this to be a primary use of any heat capture system, but could be a side stream as appropriate.

3.2.2 Snow Melting

On site snow melting is an excellent application during the winter months, using hot water through in-ground tubing to melt ice and snow on the surface. This system would limit the health and safety risks associated with a build up of snow and ice, without the application of salt or sand to the site. This system would be installed similarly to a radiant floor heating system in a home, requiring the entire site to be resurfaced when installed. While this is a good use for the heat recovered from the effluent, it is only required during four months of the year in southern Ontario, this fact could negatively affect the fiscal feasibility of this captured heating option.

There would be significant capital cost associated with the implementation of this alternative if it were completed independently to other projects. In coordination with a plant upgrade where significant road works are planned, this would be a feasible option, but independently, the costs would be reasonable for the benefit. Alternatively, the pathways around the facility could be completed at a lower cost and this may be feasible due to the high cost of snow removal on smaller areas compared with parking lots and the associated labour. Again, if coordinated with other works, it may be feasible, but independently it would not be.

3.2.3 Heating for Biosolids Digester

Currently, the anaerobic digester the Guelph WWTP operates at the Mesophilic temperature of 35-37^{o}C. The emissions from this digestion contain 65% methane which is used in co-generation engines on site for electrical generation, building heating and heating of digestion tank. The co-generation system currently supplements the energy requirements previously mentioned. There is potential for the effluent heat recovery system to further supplement the heating of the digestion tanks; however, since there is already a system in place, the feasibility of this alternative is minimal.

3.2.4 Space Heating & Cooling

The heat capture system would be utilized within local buildings such as the WWTP administrative offices or the Guelph Humane society for climate control. The use of a radiant floor heating system would allow for heating and cooling of these buildings using the same system, controls will have to be installed to ensure that water pumped through the system for cooling are not below the dew point, creating condensation on the cooling surface. On average, 51% of energy usage by commercial offices is used for heating (Natural Resources Canada, 2008); this option could represent a significant energy savings. However, considering that the WWTP already utilizes the co-generation facility for some space heating, the savings would be reduced and in general, with the exception of office spaces, WWTP facilities are not heated to the same temperature as office buildings and therefore the cost savings may not be equivalent.

Furthermore, the installation of radiant heating systems would not be feasible within existing buildings independent of another project.

3.3 System Components

The two main system components discussed in this section are a heat exchanger to capture the heat from the effluent and a heat pump to upgrade the heat so it can be utilized in applications on site. The design specifications for both of these systems are in ***Appendix A*** and ***Appendix B***. The heat exchanger and the heat pump would be connected together in a closed system, with the working fluid flowing though the closed system.

3.3.1 Heat Exchanger

The type of heat exchanger selected for further discussion within this report is a counter-current flow, wide gap plate arrangement. This is the most effective and applicable type of heat exchanger for the application due to the ability of the system to be regularly cleaned and inspected to avoid fouling from contaminant build-up. Furthermore, the efficiency to floor area ratio is significantly higher than a shell and tube system which would required significant area for a low temperature gradient system. The following sections outline the basic operation principles and design specifications of this exchanger.

3.3.1.1 Heat Exchanger Specifications

Appendix A includes the design specification for a heat exchanger sized to utilize all of the effluent leaving the plant. This is a fluid to fluid heat energy transfer system comprised of 2 separate exchangers, each 4.6m x 1.2m x 3.2m in size, connected in parallel. It would be ideal that this system be installed indoors to avoid the effluent freezing with the system during extreme weather conditions, potentially requiring the construction of a dedicated building. In order to avoid having to pump the effluent, the heat exchanger would need to be installed below the hydraulic gradeline for the effluent which would likely be an underground gallery. This would have a significant impact on cost and feasibility; otherwise pumping of the effluent would be required at an additional cost.

An Ethylene Glycol mixture was selected for the thermal working fluid (the fluid that absorbs the heat from the effluent) in the event that below freezing outdoor air is required for the air intake of the system. The selected exchanger collects heat energy from the WWTP effluent, lowering its temperature by approximately 10^{o}C. The cooled effluent is then released into the Speed River.

3.3.2 Heat Pump

The heat pump was selected to upgrade the heat energy due to its sustainability compared to the natural gas boiler. The specifications of the selected heat pump are outlined in this section.

3.3.2.1 Potential Implementation Example

It is estimated that there was potential for 10 500 kW of heating potential if all of the WWTP effluent were utilized through a heat exchanger, were to be utilized. For the purposes of this report, however, the system was design based on the heating and cooling requirements of the building located on site. The estimated heating and cooing load for the buildings on site are outlined in **Table 3-2**, Building Type One includes buildings that are assumed to require more heating/cooling such as the administrative building, Humane Society building (for feasibility purposes only) and the chemical storage building. Building Type Two is the maintenance building, which was assumed to not require the same level of climate control. Based on these demands the heat pump size was determined. This assessment is for comparative purposes only as the detailed design of the system is beyond the scope of this project.

Table 3-2: Heating and cooling Load estimation based on area.

	Area (m^2)	HeatingLoad/m^2	Estimated Heating load (kWh)
Building Type One	1100	0.16 kWh	175
Building Type Two	975	0.1 kWh	92

The heat pump system contains two units with the capacity of 175 kW, to provide redundancy within the system. This allows the site to rely on the heat capture system as primary sources for climate control.

3.4 Costs Analysis

The estimated cost to capture all of the potential heat from the wastewater would be approximately $1.5 to $2.0 million and could conceivably provide 10,500 kWh of heat energy to the facility. Currently, there are no adjacent demands that could utilize that heat and the cost would not warrant the benefit.

Considering the actual potential demand of the 267 kWh for building heating purposes, a smaller system would be appropriate. The estimated cost of this system would be in the $100,000 – $200,000 range. The system would be scalable to meet the required demands for the use. The cost savings in comparison between a standard natural gas system versus a heat pump system typically have a 12 year payback period and a longer overall system lifespan, which makes them feasible for new installations. Due to the addition of the heat exchange system, which is not part of a conventional ground source heat pump system, this would extend the payback period even further and as a retrofit project, it would not be economically feasible.

3.5 Sustainability

Although the system is not economically feasible as a retrofit option, there are significant sustainability advantages associated with recovery of heat from the wastewater as an alternative to gas, electric or oil heating. The estimated greenhouse gas emissions savings associated with heating the existing buildings with heat recovered through the wastewater is 138 Tonnes/year in comparison with natural gas heating.

From an environmental sustainability standpoint, heat recovery from wastewater is preferred over other standard heating methods.

3.6 Limitations

The following represent the limitations on the energy capture system:

- The system is primarily dependent on a use for the heat. The development of a heat capture system in isolation will not be effective without a use for the heat and the development of the use may cost a similar cost to the cost of capturing the heat.
- The available uses for heat are typically highest during the period where the effluent is the coldest and therefore the cost of the system increases to increase the efficiency by extracting more heat out of colder water in order to meet the heat demands.
- The effluent quality with respect to TDS will require a higher quality of heat exchange system to prevent corrosion.
- There will be operation and maintenance costs associated with the system and although the heat is essentially available at no cost, the collection will result in a significant cost and operational requirements.
- The evaluations contained herein are based on maximum efficiency of the system. Heat pump systems are known for having some inconsistencies with achieving maximum efficiency in the field. Therefore, in any detailed evaluation of the options, this should be considered.

4. Conclusions and Recommendations

The heat capture from the wastewater effluent at the Guelph WWTP is technically feasible; however, without a defined use of adequate size to warrant the expense, it is not economically feasible as a stand-alone project.

There is a distinct sustainability advantage in terms of reduced greenhouse gas emissions to heat capture from wastewater provided that the economics and use can be achieved in a practical manner.

In the future with the development and expansion of the plant, it may be economically feasible to include an energy capture system as part of the expansion or as part of the proposed technology centre at the plant in the upcoming years. This would be a pilot program to illustrate and investigate the best methods to increase the sustainability of the facility.

References

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York Trunk Sewer and Paisley-Clythe Feedermain Municipal Class Environmental Assessment

GENIVAR Project No. 10405017

October 19, 2011

Technical Memorandum - Effluent Reuse System "Purple Pipe System"

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Project No. 111-55820-00

Colin Baker
City of Guelph
City Hall, 1 Carden Street
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Re: York Trunk Sanitary Sewer and Paisley-Clythe Feedermain
Technical Memorandum - Effluent Reuse System "Purple Pipe System"

Dear Colin:

GENIVAR Inc. is pleased to submit the draft Purple Pipe Technical Memorandum as a supporting deliverable for the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain Class Environmental Assessment Project.

This report is intended to assess the feasibility of the inclusion of a wastewater effluent reuse system "Purple Pipe" in conjunction with the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain implementation.

We trust this report meets with your approval. If you have any questions or comments please don't hesitate to contact the undersigned at (519) 827-1453.

Yours truly,
GENIVAR Inc.

Jamie Witherspoon, P.Eng., LEED AP
Project Manager

Executive Summary

As part of the York Trunk Sewer and Paisley-Clythe Feedermain Class Environmental Assessment project, a component of the project terms of reference was the review of the opportunities to include an effluent reuse or, “Purple Pipe”, system with the implementation of this project. The intent of the scope was to determine if there were synergies in terms of deferring future potable water demands and thus extending the lifespan of existing potable water supplies within the City.

Purple Pipe systems are prevalent in the southern United States due to the scarcity of water; however, in Canada, there are no significant systems and therefore the legislation controlling their implementation are minimal. The US Environmental Protection Agency delineates different categories of effluent quality as follows:

- Unrestricted Urban Reuse & Recreational Use - Unrestricted refers to the contact the general public will have with water treated to this quality. This category would include the irrigation of parks and sports fields, fire protection, decorative fountains and urban uses, such as toilet flushing.
- Restricted Urban Reuse - This category restricts use of reclaimed water to activities that result in no contact with the general public, or where the areas affected are restricted from the general public. This level of water quality could be used for private landscape irrigation, municipal works uses, such as street cleaning and sewer flushing, and for construction purposes, such as site dust control and concrete making.
- Industrial Reuse - Industrial uses of reclaimed water varies based on the requirements of the industry, this could include the use of reclaimed water for equipment washing, cooling towers, stack scrubbing, boiler feed, and process water.
- Groundwater Recharge - Groundwater recharge is used to ensure a stable, high quality, ground water supply. This process requires reclaimed water of a high quality to be pumped into a holding area, where it is allowed to infiltrate into the water table below, replenishing the ground water supply.

The City of Guelph WWTP effluent quality is amongst the highest quality released by any wastewater treatment plant in Canada. The City of Guelph WWTP Effluent currently complies with all of the effluent reuse categories except for Unrestricted Urban Reuse and Recreational Use. Minimal additional treatment, therefore, is required to provide comprehensive effluent reuse systems within the City. There would be a need to provide supplemental disinfection to achieve the highest quality of effluent reuse; however, that could be done off-line from the main sewage flows to service only the effluent reuse system. There are some issues due elevated total dissolved solids associated with water softener usage in the City which may limit the use of the effluent for extensive irrigation purposes. This is not considered a major concern, but it may also be limiting for other uses such as cooling or other processes where scale or corrosion may be an issue.

As the City has a finite water supply available currently, there will be a need to develop alternative supplies; however, effluent reuse could provide the opportunity to defer potable supply development. The lifecycle cost of development of groundwater supplies is estimated at $0.09/m^3 and surface water supplies are estimated at $0.30/m^3. For effluent reuse to be feasible in the short-term, it would need to be less expensive than groundwater supplies, and in the long term, less expensive than a surface water supply.

There are a variety of potential consumers within the City, including the Guelph Innovation District, The Cutten Fields Golf Course, City sports fields, and bulk, consumers such as street sweeping, sewer flushing and dust control uses that could benefit from an effluent reuse system combined with the York Trunk Sewer and Paisley-Clythe Feedermain project. Some of the larger users would have intermittent peak demands that could not be reasonably sustained by a municipal system and local storage and pumping would be necessary. The estimated peak daily demand would be approximately 3,050 m^3/d (excluding peak instantaneous demands for golf courses). This value represents sites that could be

serviced directly from the alignment of the proposed linear infrastructure associated with the Class EA project. Due to the types of demands, there is a significant variation from summer to winter demands and any system would need to be flexible to address this variation without additional operation and maintenance costs.

In order to implement a Purple Pipe system in conjunction with the York Trunk Sewer and Paisley-Clythe Feedermain project, the following primary infrastructure would be required:

- Effluent pumping and Treatment System
    - This would consist of screening and disinfection, located at the WWTP, drawing effluent from the outlet of the existing treatment process. The estimated cost of this component of the system is $650,000 for a design flow of 3,050 m^3/day.
- Bulk Effluent Loading Depot
    - This would consist of a metered connection to allow tankers to be filled for non-potable water use, such as street sweeping, sewer flushing, etc. The estimated cost of this component of the system is $70,000 for a basic system.
- Purple Pipe Distribution Main
    - This would consist of a 4.5 km long 250 mm diameter effluent distribution main along the same alignment as the proposed sewer and water infrastructure. The estimated cost of this component of the system is $1,125,000.

With the inclusion of miscellaneous costs associated with the design and contingencies, the estimated total cost of the basic Purple Pipe system would be estimated at $2.9 million (+50%-30%). This cost does not include the private side works required to integrate the effluent reuse system into the end users systems. The annual operation and maintenance costs for the system are estimated at $100,000 per year and the lifecycle cost for the system is estimated at $0.27/$m^3$.

From a cost perspective, therefore, the full scale Purple Pipe system would not be considered economically practical in the short term, but could become economically feasible once local groundwater supplies are fully utilized and the City is required to look towards a surface water supply.

It is recommended at this time that the City consider a pilot implementation of a bulk effluent supply system to reduce potable water use in the City and, going forward, revisit the Purple Pipe issue with each update of the Sewage and Water Supply Master Plan.

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Glossary of Terms and Abbreviations

Reclaimed water is treated effluent of a quality suitable for specific reuse application.

Water reuse is the use of treated wastewater for beneficial purposes. Direct reuse refers to a system in which reclaimed water is transported to the points of reuse. Indirect reuse implies discharge of an effluent into receiving water (surface or ground water) for assimilation and withdrawals downstream.

MOE- Ontario Ministry of the Environment

GRCA- Grand River Conservation Authority

US EPA- United States Environmental Protection Agency

AWWA - American Water Works Association

WWTP - Wastewater Treatment Plant

CFU- Colony Forming Units: is a measure of viable bacterial numbers in a sample

NTU- Nephelometric Turbidity Units: refers to method of measuring turbidity with a nephelometer

COD – Chemical Oxygen Demand: used to measure the amount of organic compounds in water

BOD5 – Biological Oxygen Demand: amount of dissolved oxygen consumed by biological organisms per litre of sample during 5 days at 20^{o}C.

TSS - Total Suspended Solids

TDS –Total Dissolved Solids

PVC - Polyvinyl Chloride

MBR - Membrane Bioreactor: is a combination of a suspended growth bioreactor and microfiltration membrane

1. Introduction

The intent of this report is to review the feasibility of the installation of a “Purple Pipe” Effluent Reuse Distribution System in conjunction with the installation of the York Trunk Sewer & Paisley-Clythe Feedermain. The Purple Pipe Distribution System could theoretically follow the proposed alignment of the York Trunk Sewer & Paisley-Clythe Feedermain to transport effluent from the City of Guelph’s Wastewater Treatment Plant (WWTP) to areas within the city that may have the capacity to utilize the reclaimed water for non-potable uses. Utilization of reclaimed water could reduce the demand on the potable water supply which would assist the City of Guelph to achieve the goals set by the 2008 Guelph Water Conservation and Efficiency Study (RMSi, 2009), to make Guelph the Canadian city with the lowest potable water usage per capita.

The Guelph WWTP currently discharges approximately 54,000 m^3/d into the Speed River (CH2MHILL, 2009). With a current population of approximately 118,000, this is an average discharge of 460 L/c/d. With the population of Guelph projected to grow to 195,000 by 2031, the discharge of the WWTP will reach over 80,000 m^3/d, this is assuming a 10% reduction in per capita water discharge. Reclaimed water is a consistent resource of non-potable water which could be utilized for non-potable uses such as non-contact sewage conveyance (toilet flushing) and irrigation. This would assist in mitigating the increased demand on the potable water supply as a result of the population growth.

1.1 Background

This section identifies the scope of report and regulations pertaining to the application of a water reuse system at the municipal level. It also outlines the potential applications within the City of Guelph based on effluent quality.

1.1.1 Scope of Work

In accordance with the Terms of Reference for the project, the secondary goal of the Class EA is to examine distribution requirements within the east-west study area for a treated wastewater effluent reuse program or “Purple-Pipe” system with the Paisley-Clythe Feedermain and/or York Trunk Sewer Upgrades.

1.1.2 Regulations

Currently there are no regulations or guidelines that encompass all aspects of wastewater reuse in Ontario. For the purposes of this report the US EPA Guidelines for water reuse will be used. The US EPA guidelines are an extensive document which identifies, in detail, types of reuse and limitations associated with them, technical planning issues, current applications, and regulations of water reuse within the United States. **Section 2.3** outlines the US EPA guidelines that are applicable to the City of Guelph water reuse program.

Additional regulations in Canada, at the national level, that could affect implementation of a water reuse system are (CMHC-SCHL, 1999):

- The Guidelines for Canadian Drinking Water Quality (1996);
- The Guidelines for Canadian Recreational Water Quality (1992);
- The National Plumbing Code of Canada (1995) ;
- Ontario Building Code (limits the use of grey water to toilet flushing);and,
- Heath Canada’s regulations for the use of reclaimed water for toilet and urinal flushing (2010).

1.1.3 Existing Guelph Effluent Quality

The City of Guelph WWTP effluent quality is amongst the highest released by any wastewater treatment plant in Canada. Guelph effluent is regarded by the GRCA as at the very top in terms of treatment and the highest effluent quality of the 26 municipalities that discharge into the Speed River. **Table 1-1** presents the monthly averages of wastewater parameters recorded by the Municipal WWTP staff in 2010.

Table 1-1: City of Guelph Wastewater Quality Data - 2010

Average Month	pH	Temp °C	DO mg/L (2011)	$cBOD_5$ mg/L	E.Coli CFU/100 mL	TKN mg/L	Total Ammonium Nitrogen mg/L	TSS mg/L	TDS mg/L (2002)	VSS mg/L (2002)
January	7.7	12.9	8.8	2.8	31	1.7	0.65	2	1295.6	2.4
February	7.8	12.7	8.9	2.2	18	1.93	0.66	2	1331.5	1.1
March	7.7	12.7	9.4	4.8	19	1.7	0.92	3	1318.5	1.1
April	7.8	14.6	9.5	2.1	12	1.44	0.22	2	1231.2	1.4
May	7.8	16.6	9.2	2.5	18	1.22	0.07	2	1217.0	1.1
June	7.8	18.3	9.0	2.0	35	1.28	0.21	2	1222.5	1.2
July	7.9	20.5	9.1	3.0	97	1.27	0.20	2	1234.8	1.4
August	8.0	21.6	8.4	2.0	46	1.28	0.11	2	1301.2	1.4
September	7.9	20.9	n/a	2.0	25	1.48	0.37	2	1291.3	2.6
October	7.8	19.1	n/a	2.1	32	2.63	1.48	2	1313.2	1.7
November	7.9	17.2	n/a	2.2	14	2.12	0.36	2	1259.5	1.7
December	7.8	14.7	n/a	2.4	18	1.58	0.35	2	1271.5	1.6
Annual Average	**7.8**	**16.8**	**9.0**	**2.5**	**30.4**	**1.6**	**0.5**	**2.1**	**1274.0**	**1.6**
Winter Average	**7.8**	**14.0**	**9.0**	**2.9**	**20.0**	**1.8**	**0.6**	**2.2**	**1295.3**	**1.6**
Summer Average	**7.9**	**18.8**	**8.9**	**2.2**	**37.9**	**1.5**	**0.4**	**2.0**	**1258.7**	**1.5**

1.1.4 Reclaimed Water Quality Guidelines

The US EPA outlines ten main water reuse categories based on the quality of the water required for specific and uses (USEPA 2004). The four categories that pertain to the City of Guelph, based on land uses within the study area would be:

- Unrestricted Urban Reuse & Unrestricted Recreational Use;
- Restricted Urban Reuse;
- Industrial Reuse; and,
- Groundwater Recharge.

1.1.4.1 Unrestricted Urban Reuse & Unrestricted Recreational Use

Unrestricted refers to the contact the general public will have with water treated to this quality. This category would include the irrigation of parks and sports fields, fire protection, decorative fountains and urban uses such as toilet flushing. The water quality requirements for unrestricted public access identified by the US EPA Guidelines are shown in **Table 1-2**. This table also includes Health Canada's regulations for the use of reclaimed water for toilet and urinal flushing (Health Canada, 2010).

1.1.4.2 Restricted Urban Reuse

This category restricts the use of reclaimed water to activities that result in no contact with the general public, or where the areas affected are restricted from the general public. This level of water quality could be used for private landscape irrigation, municipal works uses, such as street cleaning and sewer flushing, and for construction purposes, such as site dust control and concrete making. The water quality requirements identified by the US EPA Guidelines for Restricted Urban Reuse are shown in **Table 1-2**.

1.1.4.3 Industrial Reuse

Industrial use of reclaimed water varies based on the requirements of the industry. This could include the use of reclaimed water for equipment washing, cooling towers, stack scrubbing, boiler feed and process water. The water quality requirements identified by the US EPA Guidelines for Industrial Reuse are shown in **Table 1-2**.

1.1.4.4 Groundwater Recharge

Groundwater recharge is used to ensure a stable, high quality, groundwater supply. This process requires reclaimed water of a high quality to be pumped into a holding area, where it is allowed to infiltrate into the water table below, replenishing the ground water supply. The water quality requirements identified by the US EPA Guidelines for Groundwater Recharge use are shown in **Table 1-2**.

Table 1-2: Standards for Quality of Reclaimed Water and City of Guelph Effluent Quality (US EPA, 2004)

Parameter	**City of Guelph Effluent**	Unrestricted Urban Use & Unrestricted Recreational Use	Restricted Urban Reuse	Industrial Reuse	Groundwater Recharge
BOD_5	**2.5 mg/L**	5-30 mg/L	20-30 mg/L	20 mg/L	5 mg/L
TSS	**2.1 mg/L**	5-30 mg/L	5-30 mg/L	20 mg/L	5-10 mg/L
Turbidity	**-**	0-2 NTU	2-3 NTU	3 NTU	2 NTU
Fecal Coliforms (E.Coli)	**30.4 CFU/100 mL**	0-2.2 CFU /100 mL	23-200 CFU /100 mL	23-200 CFU /100 mL	2.2 CFU /100 mL
Total Nitrogen	**0.5 mg/L**	≥0.5 mg/L	-	-	12 mg/L
Total Chlorine Residual (Health Canada, 2010)	**0.02 mg/L**	5-30 mg/L	-	-	-

1.1.5 Effluent Reuse Need - Guelph

The use of reclaimed water to supplement the demand of municipal potable water would lower the current demand on the potable water supply, thus increasing the lifespan of the municipal water source. The current City of Guelph drinking water system includes 18 ground water wells, which are utilized continuously, located within the City boundaries. The system also includes a groundwater collection system located at Arkell Springs Grounds. This system collects shallow groundwater from subsurface gravel deposits. To supplement the supply, which is dependent on the annual precipitation, the City pumps water from the Eramosa River into infiltration trenches during the spring months.

Through the completion of the City of Guelph Water Supply Master Plan, in 2006, the City evaluated the lifespan of the current potable water supply and potential additional sources to address the future growth in demand. The alternative sources of potable water suggested by this report are summarized in **Table 1-3** along with a suggested time frame for implementation and the estimated cost per added capacity.

Table 1-3: Summary of 2006 Guelph Water Supply Master Plan recommendations.

WSMP Recommendation	Recommended Term	Added Capacity (m3/d)	Capital cost of capacity gained ($/L)
Groundwater in City	Short to Medium	59,017	$0.09
Groundwater Outside City	Medium	22,032	$0.30
New Local Surface Water	Medium to Long	27,123	$0.30
Great Lakes Water Supply	Medium to Long	No Limit	-

The recommendations in **Table 1-3** indicate that the City of Guelph will need to investigate future demands outside of the City boundaries within the next 10 years. The use of reclaimed water could effectively replace the use of a significant component of the demand; however, it would not be required for a minimum of 10 years depending on the cost of effluent reuse. The increase in water supply by incorporating reclaimed water in the system could postpone the installation of new water supplies outside of the city if it is economically feasible.

2. Potential Consumers

This section identifies potential uses of reclaimed water within the City of Guelph based on the location for the proposed alignment of the York Trunk Sewer & Paisley-Clythe Feedermain.

2.1 Unrestricted Urban Use & Recreational Use

The following applications could potentially be implemented within the City of Guelph, if the end users were to further disinfect the current effluent, or the quality of the WWTP effluent were to improve by reducing the Fecal Coliforms to levels consistently below 2.2 CFU/100mL.

2.1.1 Urban Applications

Urban applications would require urban buildings to be constructed with, or retrofitted with, a dual pipe system consisting of potable and non-potable piping with cross-connection control. The reclaimed water would be used for laundry and the flushing of residential and commercial toilets and urinals. This would require that the effluent be treated to unrestricted water quality, as it is not possible to control the amount of contact the general public will have with the water supply. It would be ideal to install this infrastructure throughout a new development, such as the Guelph Innovation District, to gain the most benefit from the investment of infrastructure installation.

The proposed residential population within the Guelph Innovation Districtis reported to be 5,000 with the creation of an additional 10,000 jobs in the area (City of Guelph, 2011). Assuming that 30% of the 10,000 employment positions in the areas are commercial, using 17% of the 230 L/c/d water demand (Water Management Inc., 2010). The estimated water demand for the Guelph Innovation District is 541 m^3/d based on the estimate that 30% the 230 L/c/d water demand is used for flushing toilets. **Figure 2-1** identifies the zoning areas of the proposed Innovation District.

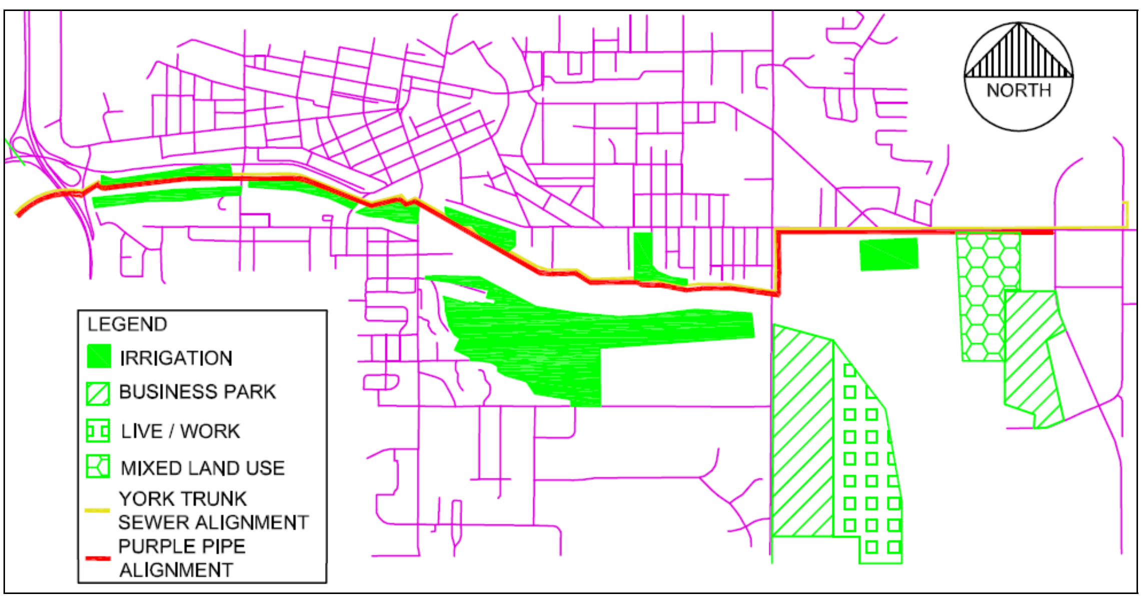


Figure 2-1: Potential Locations of Unrestricted Access Water Reuse

The use of reclaimed water for fire protection requires a consistent supply pressure, emergency storage and backup systems to meet provincial requirements. For these reasons fire flow usage for reclaimed water will not be considered for implementation within the City of Guelph at this time.

2.1.2 Construction Uses

Various aspects of construction currently use potable water for tasks such as dust control and equipment washing. Reclaimed water could easily be utilized for these tasks with limited infrastructure installation as they require only a bulk fill / washing station in a central area. It is estimated that the demand would be 102 m^3/d throughout the summer months, during business hours. This estimation is based on the application of 6.35 mm of reclaimed water over an area of 4,000 m^2 per municipal construction site. Assuming that reclaimed water is utilized at five construction sites, each lasting 20 days, it is estimated that a total of 10,160 m^3 will be used per year for dust control. This is likely a conservative estimate during a normal construction season, but is also a function of weather during the summer.

2.1.3 Municipal Irrigation

Sports fields located along the proposed sewer alignment would be ideal locations for the utilization of reclaimed water for irrigation purposes. Additional infrastructure installation beyond a central supply main would be limited due to the possibility of combined construction with the proposed alignment of the York Trunk Sewer. The cost will be minimal, in comparison to supplying irrigation to other park locations in the city.

Irrigation of planters and hanging baskets in the city of Guelph's downtown area is an activity that continues throughout the summer during regular business hours. Irrigation is preformed by a worker with a watering truck who manually waters the flowers. The infrastructure required to initiate this type of water reuse is a bulk filling station, similar to the dust control uses previously mentioned.

Irrigation of municipal sports fields along the Speed River and proposed sewer alignment, in addition to garden irrigation in the downtown area of Guelph, would require approximately 100 m^3/d for parks irrigation and up to 0.80 m^3/d used for daily irrigation of flowerpots, during four summer months of the year. The water requirement for the irrigation of the municipal sports fields is based in the application of 20 mm of water per hectare once a week. The water utilized in the irrigation of the flower planters located in the Guelph downtown core was determined based on the application of 3L/planter twice a week as recommended by industry standards. A conservative estimate of 400 planters was used; this includes hanging flower baskets (approximately every 5m throughout the downtown area) and large flower boxes located along the boulevards.

2.1.4 Golf Course Irrigation

The Cutten Fields Golf Course is located along the south bank of the Eramosa River, between Victoria Road South and Gordon Street. The course covers an area of approximately 35 hectares and is watered on a regular basis overnight. The water required for irrigation is currently drawn from the Eramosa River and held in an irrigation pond on-site until required. Currently, the course has a Permit to Take Water from the MOE. Allowing the site to take water at a minimal cost per volume, the cost of the infrastructure and conveyance of reclaimed water to the course will have to be economical for the course to consider implementation.

The average golf course irrigation system is generally operated at a higher pressure then the municipal distribution system. As a result, the golf course would have to utilize a storage pond and a booster pump system to maintain the required pressure. This infrastructure currently exists based on their current water supply.

The quantity of water used on a daily basis is in the order of 1,100 m^3/d. Irrigation of golf courses would require unrestricted reclaimed water quality, as it is not possible to ensure the public will have no access to the irrigation water.

2.1.5 Unrestricted Access Demand Summary

Below are the daily and annual estimated demands for reclaimed water that is of MOE unrestricted quality standard.

- Urban Uses: 541 m^3/d, All year (197,000 m^3/yr);
- Construction: 102 m^3/d, Summer only (9 000 m^3/yr);
- Municipal Irrigation: 100.8 m^3/d, Summer only (8 800 m^3/yr) ; and,
- Golf course Irrigation: 1100 m^3/d, Summer only (97 000 m^3/yr).

2.2 Restricted Urban Reuse

The following section identifies urban applications can utilize restricted urban use quality reclaimed water within the City of Guelph. This quality is equivalent to the current Guelph WWTP effluent.

2.2.1 Street Sweeping

Street sweeping is completed by the City of Guelph and hired contractors thought the month of April. It is estimated that 144 m^3/d would be used to sweep 500 km of asphalt roadway in one month. This estimation is based on the application of 6mm of water to every linear meter of road way over a month period in the spring. The use of reclaimed water instead of potable water for dust control could be implemented in the near future, as it requires limited infrastructure in the form of a bulk fill station.

2.2.2 Sewer Flushing

Sewer Flushing is a seasonal activity carried out by the City of Guelph operations staff. Large volumes of water are required to clean the sewers and prevent build up of sediment within the pipes. Once again, the use of reclaimed water could be implemented in the near future due to its lack of additional infrastructure requirements.

It is estimated that approximately 41m^3/d of water are used to complete the annual cleaning sewers. This is based on values used by the American Water Works Association in the *Water Audits and Leak Detection Report* (page 24).

2.2.3 Concrete Making

The use of reclaimed water for concrete making would be a viable alternative for the use of reclaimed water if there were a demand within close proximity to the proposed alignment. There are currently no concrete facilities within the City that could use this option.

2.2.4 Private Irrigation

Private irrigation includes the irrigation of residential properties, where the user of the reclaimed water has the appropriate training to handle water of the restricted quality level. It is important that the general public does not have access to the irrigated land at any point though the application of Restricted water. It is difficult to estimate the demand for reclaimed water for the use of private irrigation, but it is assumed that the volume would be minimal and is, therefore, not accounted for within this study.

2.2.5 Restricted Use Summary

Based on the current quality of the City of Guelph's WWTP effluent, all of the Restricted uses of reclaimed water can be implemented without any additional treatment of the WWTP effluent. It is estimated that the annual demand for restricted water would be approximately 21,700m^3/year comprised of the following:

- Street Sweeping; 144 m^3/d (April only), 3 200m^3/d.
- Sewer Flushing; 41 m^3/d (not during winter), 8 000 m^3/year.

Street sweeping and sewer flushing are uses that could be implemented in the near future with minimal investment. It is important to note that training and regulations would be required to minimize the likelihood of the general public coming into contact with reclaimed water of this quality.

2.3 Industrial Reuse

The water quality required by the industry would be dependent on the type of industry utilizing the reclaimed water. Unfortunately, there are limited industries within close proximity to the proposed alignment of the York Trunk Sewer & Paisley-Clythe Feedermain. Currently, Owens Corning, a fibreglass manufacturer, is the only large industry within the study area, located between the north bank of the Eramosa River and York Road. As fibreglass manufacturing is not a water intensive process there is limited demand at this facility. There is however, potential of future industries located within the proposed

Guelph Innovation District to utilize reclaimed water, as these demands are unknown at this time, industry water usage will not be considered further within this study at this time.

2.4 Groundwater Recharge

Currently, the City of Guelph utilizes groundwater recharge at the Arkell Springs Grounds, to the east of the Eramosa River, up-stream from the Guelph WWTP, for its municipal water supply. Water from the Eramosa River is pumped into infiltration areas, where the water is filtered by the soil and enters the water table.

An increase in the quality of the effluent could enable the reclaimed water to be utilized for the purpose of ground water recharge, although, along the proposed alignment there is limited space to develop such a site. There would likely be significant public concern regarding this option and it should be considered carefully before proceeding with this option.

2.5 Specific Opportunities

The potential locations, within close proximity of the York Trunk Sewer & Paisley-Clythe Feedermain where reclaimed water can be used as previously identified are outlined in **Table 2-1**:

Table 2-1: Summary of Specific Opportunities for reclaimed water within the City of Guelph

Name	Location	Description	Effluent Quality Required	Seasonal
Innovation District	Site is bound by Victoria Road, Watson Road, York Road and Stone Road.	Multi-use development with a focus on sustainable practices.	Restricted urban Access	No
Better Beef-Cargill	Watson Road between York Road and Stone Road.	Food processing Facility.	Dependent on usage	No
Municipal Solid Waste Facility	Watson Road between York Road and Stone Road.	Solid waste transfer station, recycling plant and organic composting facility.	Dependent on usage	No
Lafarge Lands	East of the Hanlon Parkway and North of Wellington Road.	Commercial development.	Restricted urban Access	No
Cutten Fields	South of the Eramosa River, bound by Collage Street, Gordon Road and Victoria Road	Private Golf Club	Restricted urban Access	Yes

2.6 Effluent Demand Characteristics

The estimated demand for reclaimed water along the York Trunk Sewer & Paisley-Clythe Feedermain alignment was estimated based on current and future land uses. This section evaluated the demand characteristics associated with the potential consumers identified in **Section 2.1**and **Section 2.2**of this report. The demand characteristics identify when the reclaimed water will be used throughout the day for each activity.

Figure 2-2 shows the comparison of estimated demands for the identified uses of the reclaimed water from the City of Guelph WWTP. This figure shows that the irrigation of the golf course is the most water demanding activity and is primarily used outside of business hours. The second largest demand is construction use (dust control and street sweeping), which would utilize reclaimed water during business hours. The demand trends for toilet flushing and commercial uses are based on the current average demands for residential and commercial water use.

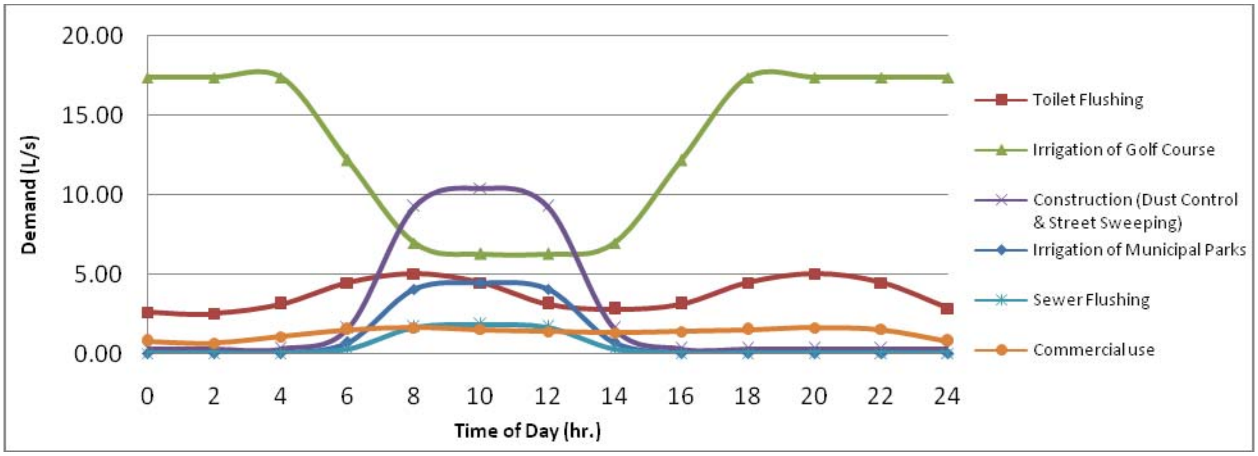


Figure 2-2: Daily Demands for reclaimed water from all estimated uses.

Most of the activities occur within the summer months, including the two activities with the highest demands (irrigation and construction). This leads to a large difference in demand when comparing the winter months to the summer months. This fluctuation in demand throughout the year is shown in Figure 2-3 as the average daily total demand increases from 4L/s in the winter to approximately 22L/s in the summer.

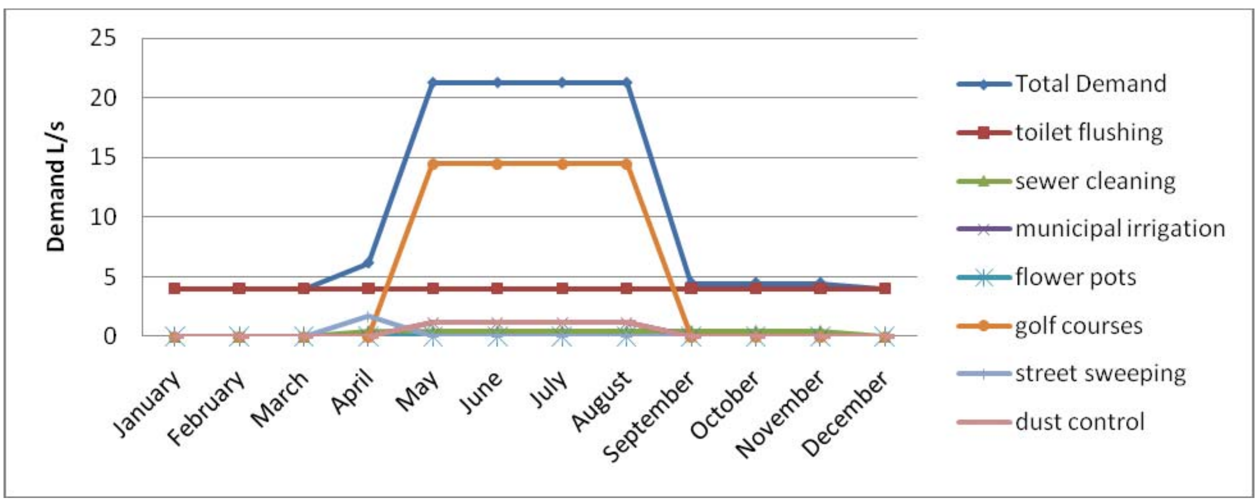


Figure 2-3: Estimated Annual Reclaimed Water Demand

Figure 2-4 and **Figure 2-5** show the daily demand trends and the average daily demand for the high demand period (summer demand) and the low demand period (winter demand). Using these figures, the design flow for the system was determined to be 22L/s, since the system design flow should be such that the average summer demand is continuously met. The storage requirements were also determined based on these trends. Storage is discussed further in **Section 2.6.1**.

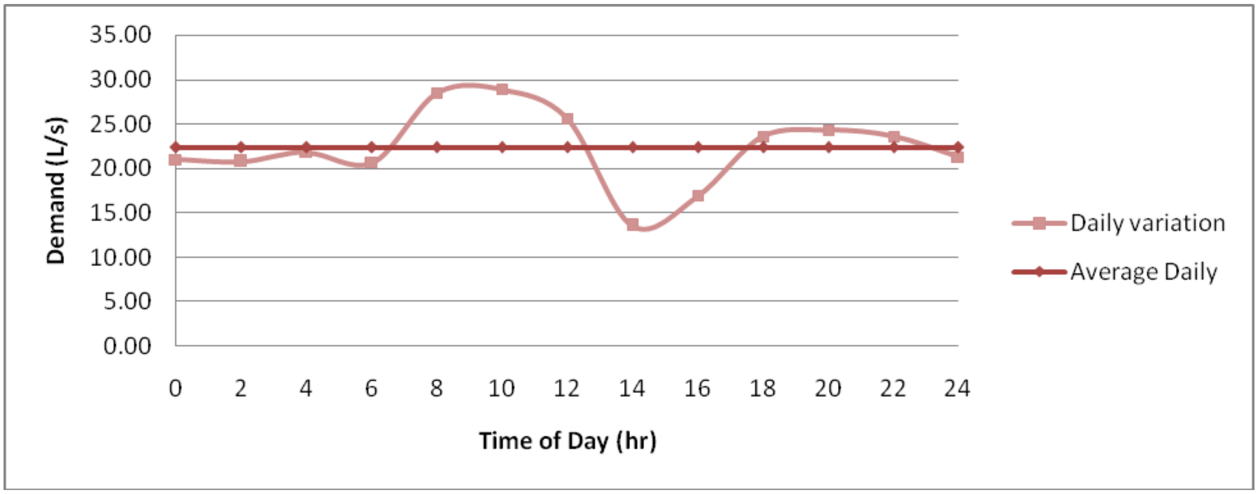


Figure 2-4: Estimated average and instantaneous demand during summer months (May to September)

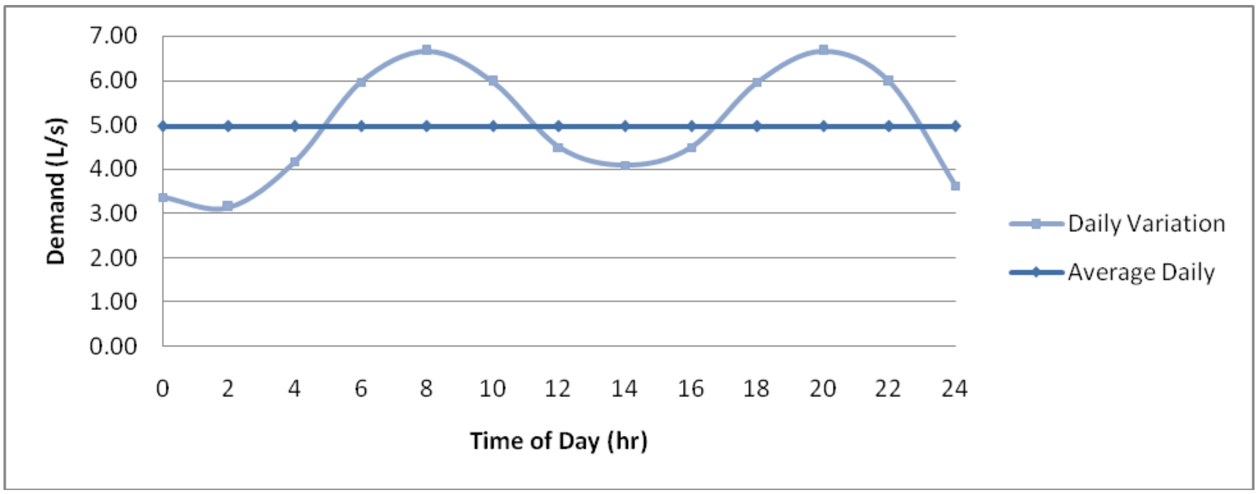


Figure 2-5: Estimated average and instantaneous demand during winter months (October to April)

2.6.1 Storage

Storage capacity within the distribution system is important to meet the potential variable reuse water demands. The estimation of the required storage was based in the demands identified in the previous section. A conservative and preliminary estimation based on the difference between the average summer demand (22L/s) and the peak summer demand (28L/s) and the length of time the demand is above the average demand (6 hours, shown in **Figure 2-4**), indicates that the system should be designed with a minimum of 254 m^3 of daily storage; however, utilizing the MOE design standard for water storage excluding fire storage, the required storage would be 635 m^3. An order of magnitude cost of the storage would vary from a minimum of $125,000 to approximately $635,000 depending on the configuration. At this cost, it may be more practical to increase the size of the treatment system rather than provide the storage, as effluent availability is not an issue.

2.7 System Limitations

This section outlines the potential limitations associated with water reuse within the City of Guelph, such as; water quality, regulations, public health, public perception, cost, and local hydrology.

2.7.1 Fecal Coliform

At the current levels of Fecal Coliforms, the potential uses of the reclaimed water are limited to the Restricted and Industrial activities. In order to meet other demands, the Fecal Coliform levels must be reduced. The cost to upgrade the WWTP treatment to reduce the total Fecal Coliforms found within the WWTP effluent would be an expensive process. The WWTP Master Plan (CH2MHILL, 2009) included recommendations for upgrades of the WWTP system to involve membrane filtration by the year 2024 to meet projected treatment requirements. The report estimates that these upgrades will have capital costs of approximately \$60 million, with average operational and maintenance costs of over \$400,000 per year.

It would not be necessary to upgrade the entire system to achieve the higher effluent quality, as a separate disinfection stream could be utilized to meet a higher effluent reuse standard for a smaller quantity of effluent, as detailed in **Section 3.2.1**.

2.7.2 Total Dissolved Solids

Total Dissolved Solid (TDS) are the inorganic salts and small amounts of organic matter present in solution in water, usually calcium, magnesium, sodium, chloride and sulfates. These solids can potentially accumulate within soils, damaging the soil structure and limiting the growth potential of the irrigated land. Levels of TDS found within the Guelph's WWTP effluent, in a 2002 study, are on average 1,300 mg/L. A study completed in 1999 of the effects of salinity and irrigation in the Canadian Prairies, classifies the level of TDS found in the Guelph effluent at 'possibly safe' (TDS between 700 mg/L and 1,750 mg/L). Generally, forage crops, which include grass, are the most resistant to salinity (Peterson, 1999). Limited studies have been previously completed on the topic of turf irrigation using WWTP effluent.

Currently the University of Guelph is performing a study on the effects of WWTP effluent on vegetation. This study uses municipal wastewater, after tertiary and secondary treatment, applied to three different cultivars of Kentucky bluegrass. The study is ongoing, but it has reported that preliminary results indicate that salt has a bigger effect on turf growth than any other wastewater parameter. It would not be practical to address TDS in a treatment process at this stage as a nanofiltration or reverse osmosis system would be required.

2.7.3 Regulations

The absence of existing regulations in Ontario poses a challenge to the ease of implementation for the Water Reuse Distribution System. Consultation with the MOE, GRCA and other local organizations is important for the development of a safe and effective Water Reuse Distribution System.

2.7.4 Health Risks

The health risks associated with water reuse systems are generally related to exposure to chemicals or microbial agents within the reclaimed water. Exposure can occur directly (skin contacts, ingestion of aerosols) or indirectly (ingestion of uncooked food irrigated with reclaimed water). This risk is the reason for the restricted and unrestricted classifications of reclaimed water.

2.7.5 Public Perception

It is expected that there will be a level of public reluctance towards wastewater reuse, as waste water reuse is largely unknown in Ontario. The water reuse program can be not be implemented without public approval. It is important; therefore, that the public be informed throughout the developmental stages of the water recapture design. Prior to public consultation, it is important to establish risk assessment and management practices to address health and safety concerns. It is vital that public health and safety are paramount when developing the system, as this will address the primary concern of the public.

2.7.1 Local Hydrology

Currently, the WWTP discharges an average of 54,000 m^3/d into the Speed River. This is approximately 15% of the total yearly average daily flow rate of the river, which is 375,000 m^3/d, just downstream of the plant. During low flow periods in the late summer, the assimilative capacity of the Speed River is at its lowest, resulting in the WWTP effluent flow accounting for 44% of the Speed River flow. The assimilative capacity of the river is controlled by the release of water from the Guelph Reservoir, located upstream of the WWTP. The effluent from the WWTP acts as an indirect potable water source for downstream water supplies and provides additional assimilative capacity to downstream discharges. With reduced amounts of effluent being discharged into the Speed River, the Guelph reservoir will not be required to discharge water for the purpose of increasing the assimilative capacity.

The use of reclaimed water to offset the City of Guelph's water demand will lower the overall demand on the local ground water supply. This could extend the lifespan of the current water supply system and allow the municipality to save the resources required to locate new fresh water sources.

It is difficult to determine the exact outcome the water reuse on the local water system, since the use of reclaimed water will lower the demand on the ground water system while also lowering the flow into the surface water system via the Speed River. Detailed analysis of the relations between the ground and surface water system should be completed to ensure that the lowering of the discharge to the Speed River will not adversely affect the Grand River watershed.

3. Infrastructure Requirements

This section identifies the potential infrastructure components required by the City of Guelph effluent reuse system.

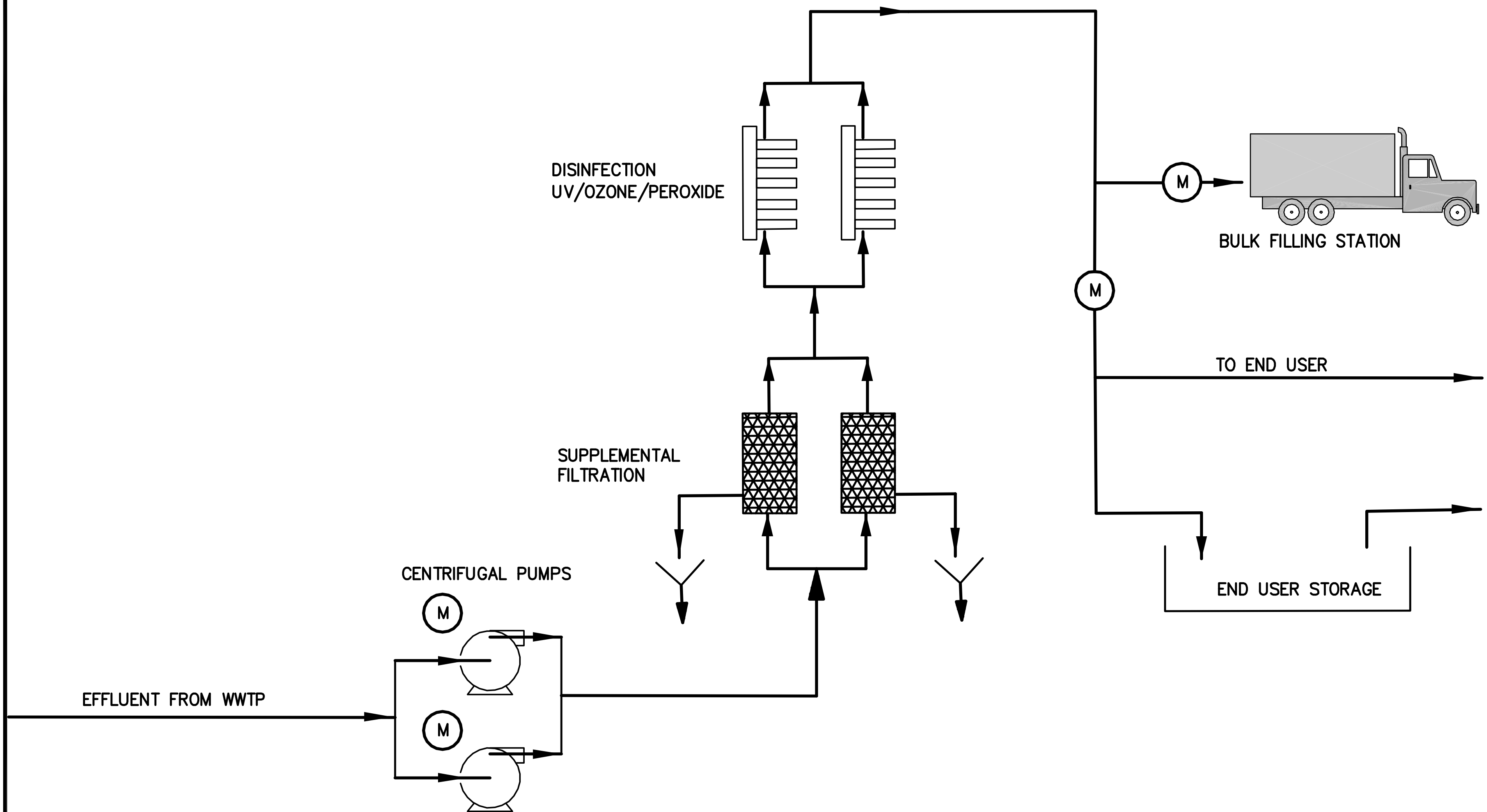
3.1 System Design Philosophy

Due to the variability of the demand, both seasonally and hourly, there may be a need for peak demand management using several techniques, as follows:

- Restricted Bulk Depot hours, limit bulk depot to operation outside of peak demand hours;
- End user storage for large users; and,
- Managed municipal uses, such as cycling field irrigation.

Based on the design flow detailed above of 11L/s the following would be the required/recommended components of the re-use system. **Figure 3-1** illustrates a block diagram of the system.

- A Diversion Structure;
- Supplementary Disinfection;
- Treated Effluent Storage (if desired);
- A High lift Pumping System;
- Automated Effluent Depot; and,
- Effluent Distribution Systems.



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PROJECT:
YORK TRUNK SANITARY SEWER AND PAISLEY-CLYTHE FEEDERMAIN – PURPLE PIPE
TECHNICAL MEMORANDUM

TITLE:
PURPLE PIPE DISTRIBUTION SYSTEM PROCESS FLOW

SCALE:
NOT TO SCALE

DATE:
OCTOBER 6, 2011

PROJECT NO:
10405017

DRAWING NO:
FIGURE 3-1

3.2 Infrastructure

The infrastructure requirements of the non-potable distribution system are similar to those of a potable water distribution system. Depending on the location and usage of the reclaimed water, the reliability, pressure, and demand may vary from the MOE standard for watermain construction. This section outlines the basic design guidelines outlined by the US EPA Guidelines for water reuse.

3.2.1 Treatment

Currently, the Guelph WWTP is classified as a conventional activated sludge system with tertiary treatment. The system includes grit removal, primary clarification, secondary treatment with an activated sludge system, secondary clarification, and tertiary treatment by Rotating Biological Contactors. This system effectively achieves the requirements of the Restricted reclaimed water use classification. Improvement would be required to achieve effluent that is of high enough quality for the unrestricted uses previously identified.

Additional treatment required to lower the Fecal Coliform levels can be provided by using UV and Ozone treatment. A benefit to this treatment application is that modular units used can be added or turned off when required to meet demands. This can allow the system to treat higher volumes of water during peak demand times, with limited negative impacts when a portion of the units are switched off. It is estimated that the additional treatment required for the system would cost approximately $200 000, this is dependant on the level and volume of treatment required. This would be enclosed within a new building as part of the pumping system.

The City of Guelph WWTP Master Plan Report (CH2MHILL, 2009) recommends the installation of membrane technology in the form of a tertiary Membrane Bioreactor (MBR) or Tertiary Membrane Filtration. The implementation of this technology would minimize the additional treatment required to achieve higher levels of reuse quality. At this stage, the treatment requirements have been selected based on current treatment.

3.2.2 Storage

As indicated in Section 3.3.1, the cost of storage at this size of system to balance flow demands is likely more costly than a modular system that can increase flow capacity to meet the peak demand. Furthermore, the provision of storage at grade would require secondary pumping, which would increase operational costs. At this time, therefore, no treated effluent storage would be provided.

3.2.3 Distribution

The optimal distribution main size would be 200mm in diameter as it would provide a minimum velocity of greater than 1.0 m/s at peak flow of 35.3 L/s. During winter demands, the peak velocity would be lower than optimal and may result in some accumulation of sediment within the pipe system, although this is unlikely due to the treatment and periodic flushing velocities. Using MOE design guidelines, this system would be limited to approximately the current peak design flow due to the length of the pipe and desirable headloss. If the main were upsized to a 250 mm diameter main, the maximum capacity would be 53.6 L/s (4,600 m^3/day) at the same velocity.

The US EPA has developed standards used in the State of Washington in regard to separation requirements between reclaimed and potable water lines. General requirements are that the minimum vertical separation between the crown of the reclaimed line, and the invert of the potable line is 0.5 meters, with the potable line above the reclaimed line or a minimum horizontal separation of 3 metres. In situations when site limitations do not allow for the identified spacing general requirements, a minimum horizontal separation of 1.5 m combined with a vertical separation of 0.5 m would provide the appropriate cross-connection prevention.

In locations where irrigation lateral lines are installed, the reclaimed water line will be at a higher elevation than the potable water line, creating the potential of cross-connections. The Washington standards suggest a minimum vertical and horizontal separation of 1.2 m. If this is not possible due to site limitations, a minimum vertical and horizontal separation of 0.5 m with the installation of an impervious barrier, such as PVC sheeting, is required.

Figure 2-1 illustrates the general location of the Purple Pipe watermain (in red) along the preferred alignment of the York Trunk sewer (in yellow). It is recommended that the watermain be installed from the City of Guelph WWTP east along the north bank of the Eramosa River and continue along York Road until the intersection with Watson Road. This will allow the watermain installation to take full advantage of the York sewer installation project and also reach the largest amount of potential consumers. It is estimated that the 250mm watermain will cost approximately $1,125,000 with the required booster pumping system estimated to cost approximately $450,000.

3.2.4 Auxiliary System Components

The components described in this section are in addition to the treatment and distribution of reclaimed water.

3.2.4.1 Bulk Filling Station

The installation of a bulk filling station will be required for the development of the street cleaning, flower irrigation, and dust control applications of reclaimed water. The location of the filling station should limit the cost of additional infrastructure. A standard bulk water depot system with metering and an accounting system would suit the application. There is also the potential for an equipment or automobile washing station to be incorporated into this facility if the water quality meets the unrestricted contaminant levels. For the purposes of this report, it is estimated that the capital cost for the bulk filling station will be approximately $50 000 based on an exterior system.

3.2.4.2 Metering

The US EPA guidelines recommend that the use of reclaimed water be metered in a similar method to potable water, with a unit price per m^3. This will allow the municipality to track the usage and still require customers to make efforts to conserve water usage. It is estimated that the capital cost for the metering system will be approximately $20,000 for the main meter into the distribution system.

3.2.5 Cost Summary

The order of magnitude cost estimate of the required infrastructure for a basic Purple Pipe system is summarized as follows:

- Treatment System - $200,000
- Pumping and Distribution - $1,575,000
- Bulk Depot and Metering - $70,000
- General Requirements (20%) – $369,000
- Contingency and Engineering (30%) - $665,000
- Total Estimate Cost ~ $2,900,000 (+50%/-30%)

Based on the capital cost per cubic metre of capacity is approximately $950. This cost does not include site specific equipment, such as service connections, hydrants, irrigation equipment or appurtenances beyond the main line. These costs would vary by site from $10,000 for a direct connection to several hundred thousand dollars for a connection across the River or into the City.

4. Conclusions and Recommendations

The following section details the conclusions regarding the Purple Pipe feasibility.

4.1 Demand

Since the installation of the Purple Pipe would be occurring prior to the demand of reclaimed water, consideration must be made for the areas that will require potential connections in the future. As previously identified, the areas along the York Trunk Sewer & Paisley-Clythe Feedermain that could utilize reclaimed water are:

- Guelph Innovation District located north of York Road between Victoria Road and Watson Parkway;
- Municipal Parks along the Speed and Eramosa Rivers between the Hanlon Expressway and Watson Parkway;
- Industry located along York Trunk Sewer & Paisley-Clythe Feedermain; and,
- Cutten Fields Golf Course located on south of Eramosa River between Gordon Road and Victoria Road.

These locations extend along the alignment of the proposed York Trunk Sewer & Paisley-Clythe Feedermain, suggesting that the Purple Pipe should extend the entire length of the York Trunk Sewer & Paisley-Clythe Feedermain to service the potential demand in the Innovation District.

Table 4-1 outlines the total potential demand for the reclaimed water uses identified within this report. The total for these demands only accounts for 4% of the total discharge from the City of Guelph's WWTP, depending on the quality of the effluent more uses of the reclaimed water can be developed and integrated in the future.

Table 4-1: Potential Demand for Reclaimed Water within the City of Guelph Proximate to Alignment.

Usage	Seasonal	Daily Demand (m^3/d)	Yearly Demand (m^3/yr)
Restricted Use			
Street Sweeping	Yes	144	3,175
Sewer Flushing	Yes	41	11,223
Unrestricted Use			
Urban Applications	No	462	168,168
Construction	Yes	101	10,160
Municipal Irrigation	Yes	100.8	8,800
Golf Course Irrigation	Yes	1250	147,000
Potential Demand for Reclaimed Water		2,131.8	348,526

Ultimately, particularly as the City of Guelph WWTP increases effluent quality, there is the potential for larger scale utilization of effluent for non-potable uses.

4.2 Cost Analysis

The following section details the cost analysis of the system relative to the deferred potable water cost savings that an effluent reuse system would permit.

4.2.1 Capital Cost

The estimated capital cost associated with the installation the basic Purple Pipe is $2.9 million This figure includes the removals, earthwork, and site work required in addition to the actual installation of the Purple Pipe forcemain if it were coordinated with the York Trunk Sewer and Paisley-Clythe Feedermain projects. It is estimated that there would be a 30-50% premium on the construction if the project were to proceed as a standalone project, due primarily to the Speed River Crossing.

4.2.2 Operation Cost

The estimated operational cost of the system will be generally limited to operation of the new treatment system and high lift pumping. There would be costs associated with the operation of the system, however. similar to the operational costs for a potable water system, excluding the testing components. At approximately \$0.09/m^3 of capacity, the cost to operate the system at the estimated demand would be approximately \$100,000/year. This includes power and operational costs. Maintenance costs per year would be in the \$20,000 – \$60,000 per year range.

4.2.3 Deferred Potable Supply Costs

As identified in **Section 1.1**, with the implementation of the Purple Pipe, the City of Guelph would effectively be increasing their potential water supply, in the form of non-potable water, by the volume of effluent discharged by the WWTP. The increase in non-potable water supply would allow the City of Guelph to defer the exploration and resulting capital cost associated with the development of a new water source. The deferred life cycle costs for the development of new potable water supplies identified in the *City of Guelph Water Master Plan* vary from \$0.09/m^3 for the expansion of the ground water system within the City of Guelph to \$0.30/m^3 for the development of new local surface water supplies.

The lifecycle cost of the proposed system at current design flow rate is approximately \$0.27/m^3, due primarily to the cost of developing the infrastructure rather than the supply. The estimated deferred cost savings, therefore, would be limited until the City is required to pursue a surface water source in the future.

Although there are high capital costs associated with the installation of the Purple Pipe, installation of the Purple Pipe in conjunction with the York Trunk Sanitary Sewer and Paisley-Clythe Feedermain will have significantly lower costs compared to the installation of the same pipe at a later date. From an economic standpoint, although there would be value in the system, it is more cost effective to continue to develop existing groundwater supplies within the City rather than the implementation of the full scale Purple Pipe system. A smaller pilot program consisting of a bulk supply depot may be a practical method of having an impact on potable water consumption for non-potable uses with out the commitment of large amounts of capital.

4.3 Summary

Although the Purple Pipe system is technically feasible, the system is not economically feasible at this time to be implemented as a distribution system in conjunction with the York Trunk Sewer and Paisley-Clythe Feedermain. The lack of economical feasibility is due to the following key points:

<u>Limited demand</u> - The total of the demands estimated in this report consist of only 4% of the total potential non-potable water demand for the entire City of Guelph. Furthermore, with the exception of users that have yet to be developed (i.e. Guelph Innovation District), major users such as the Cutten Fields Golf Course would have to incur additional costs to connect and use the system and currently there is no incentive to change from their current supply.

<u>High Lifecycle Cost</u> - Although there are capital cost savings if the Purple Pipe were to be installed with the construction of the York Trunk sewer, the lifecycle costs are approximately three times the cost of developing existing groundwater supplies in the City and, therefore, will not be economically feasible until the City needs to look outside of the City for a surface water supply, which is estimated in the longer term (20 years).

4.4 RECOMMENDATIONS

- The effluent reuse system is technically feasible and, in comparison with similar municipalities across Canada, Guelph is likely in the best position to implement a system in the future due to their high quality of effluent from the existing WWTP. At this time, the economic comparison of a Purple Pipe system in comparison with securing alternative groundwater potable supplies does not warrant the implementation of a comprehensive Purple Pipe system in conjunction with the York Trunk Sewer and Paisley-Clythe Feedermain Class Environmental Assessment Project.

- It is recommended that the City proceed with pilot scale system providing effluent to a bulk filling depot located at the WWTP for use by non-potable bulk uses (street cleaning, sewer flushing, and dust control). The estimated cost of this system would be $75,000 - $250,000 depending on the availability of infrastructure within the plant site. This would defer potable consumption by up to 300 m^3/day during peak periods.

- It is recommended that the City revisit effluent reuse opportunities with each Water and Sewage Masterplan review, as the recommendation to not proceed is only temporary as there is a time within the 20 year horizon where effluent reuse may be an effective tool for the City of Guelph to continue growth in a more sustainable manner.

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